

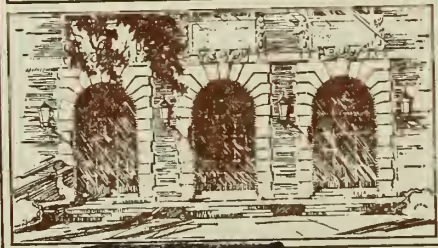
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Abstract & Citation Nos. 5401-6000

Vol. 11

No. 10

CARCINOGENESIS ABSTRACTS

National Cancer Institute

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

National Institutes of Health



CARCINOGENESIS ABSTRACTS

A monthly publication of the

National Cancer Institute

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Literature Selected, Abstracted, and Indexed
by

The Franklin Institute Research Laboratories

Science Information Services

Biomedical Section

Bruce H. Kleinstein, Ph.D., Technical Editor

Contract Number N01 CP 33309

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PREFACE

Carcinogenesis Abstracts is a publication of the National Cancer Institute. The journal serves as a vehicle through which current documentation of carcinogenesis research highlights are compiled, condensed, and disseminated on a regular basis. It represents an integral part of the Institute's program of fostering and supporting coordinated research into cancer etiology. Issues of *Carcinogenesis Abstracts* normally contain three-hundred abstracts and three-hundred citations (unaccompanied by corresponding abstracts). Abstracts and citations refer to the current scientific literature that describes the most significant carcinogenesis research carried on at the National Cancer Institute, other governmental agencies, and private institutions. *Carcinogenesis Abstracts* is intended to be a highly useful current awareness tool for scientists engaged in carcinogenesis research or related areas. The great number and diversity of publications relevant to carcinogenesis make imperative the availability of this service to investigators whose work requires that they keep abreast with current developments in the field.

Carcinogenesis Abstracts is normally published monthly. Volume XI covers the scientific literature published from Jan 1973 through Dec 1973. A cumulative subject and author index for Volume XI will be published shortly after the final regular issue. The first issue of Volume XI which would normally be dated July 1972 is being dated July 1972 - January 1973. This change is being made so that the date of publication of material included in each issue corresponds to the issue date. This journal is available free of charge to libraries and to individuals who have a professional interest in carcinogenesis. Requests for *Carcinogenesis Abstracts* from qualified individuals should include statements of their relationship to carcinogenesis research. All correspondence should be addressed as follows.

Carcinogenesis Abstracts
Room C-325
Landow Building
National Cancer Institute
National Institutes of Health
Bethesda, Maryland 20014

Use of Funds for Printing this publication
approved by the Director of the Bureau of
the Budget on July 25, 1967.



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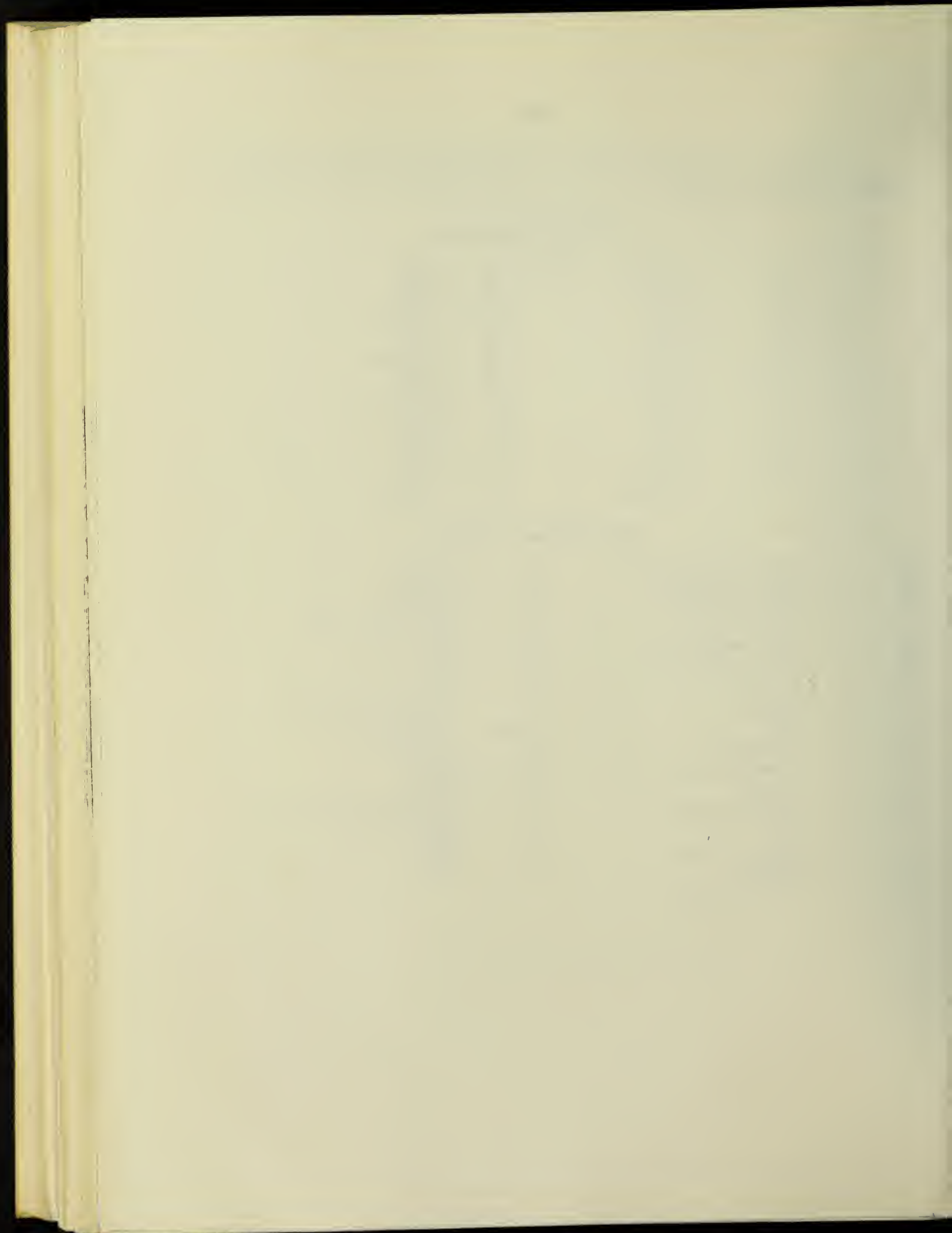
Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For journals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical Periodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
Ind.	Indonesian	Viet.	Vietnamese

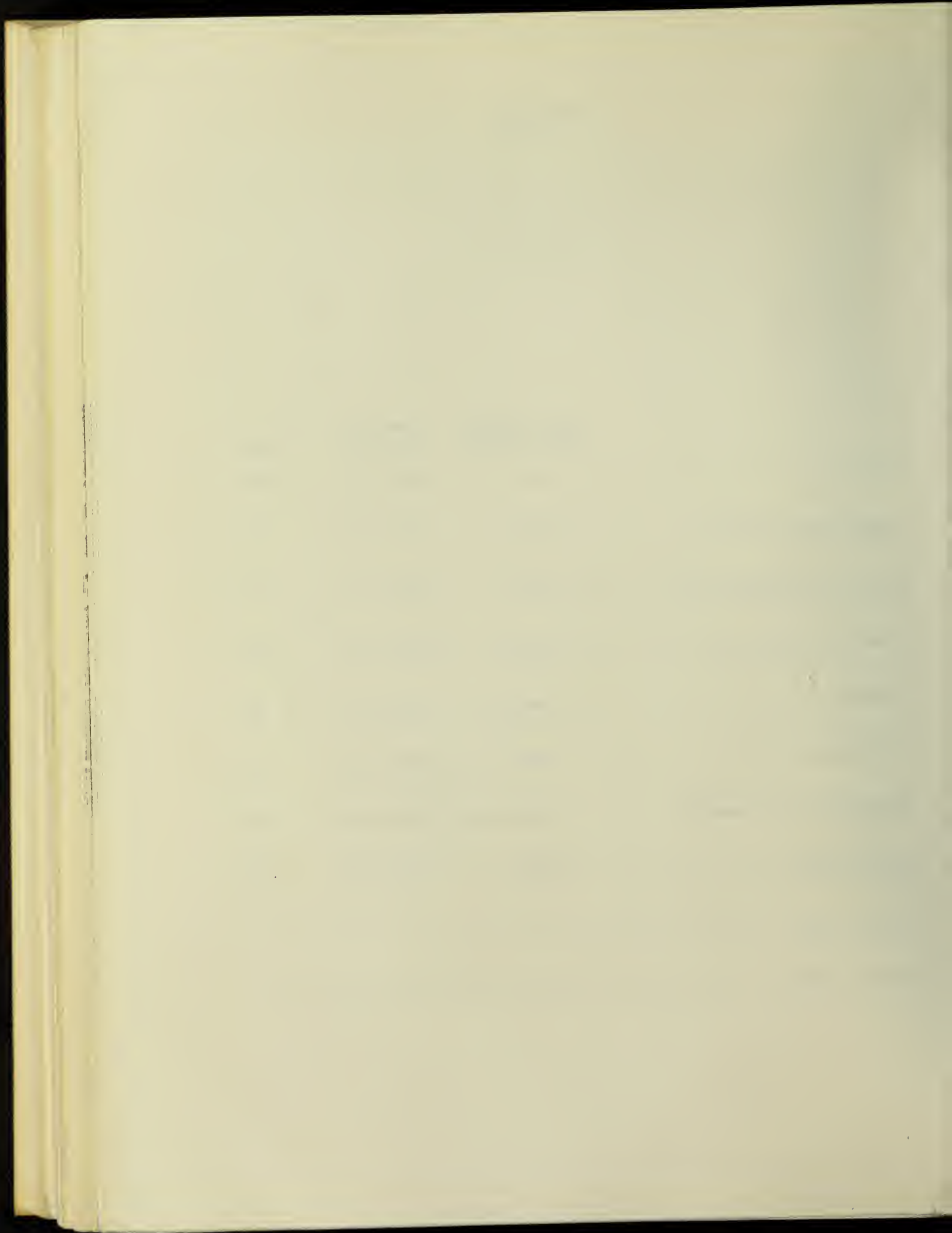
ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotrophic hormone	mg	milligram(s)
ADP	adenosine diphosphate	min	minute(s)
AMP	adenosine monophosphate	ml	milliliter(s)
ATP	adenosine triphosphate	mm	millimeter(s)
C	degrees centigrade	MTD	maximum tolerated dose
cm	centimeter(s)	ng	nanogram (10^{-9})
CNS	central nervous system	pg	picogram (10^{-12})
cpm	counts per minute	p.o.	orally
DNA	deoxyribonucleic acid	ppm	parts per million
e.g.	for example	r	Roentgen
g	gram(s)	RBC	red blood cells (erythrocytes), red blood count
µg	microgram(s)	resp.	respectively
hr	hour(s)	RNA	ribonucleic acid
i.m.	intramuscular	s.c.	subcutaneous
i.p.	intraperitoneal	sec	second(s)
IU	international unit(s)	U	unit(s)
i.v.	intravenous	UV	ultraviolet
kg	kilogram(s)	WBC	white blood cells (leukocytes), white blood count
LD ₅₀	median lethal dose(s)	wk	week(s)
m	meter(s)	wt	weight(s)
M	molar	yr	year(s)
mEq	milliequivalent(s)		
mM	millimolar		
µM	micromolar		
mC, µC	milli-, microcurie(s)		



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- 5401 HERPES VIRUSES AND CANCER. (E.) Rafferty, K. A., Jr. (U. Illinois Med. Ctr., Chicago). *Sci Am* 229(4):26-33, 1973.

Herpes viruses have been strongly implicated as the etiologic agents of the Lucké renal carcinoma of the frog, Marek's disease (lymphoid tumor) of chickens, pulmonary adenomatosis of sheep, and malignant lymphoid tumors of cottontail rabbits. The viruses that cause the Lucke tumor and Marek's disease are both immunologically related to the Epstein-Barr virus (EBV), a herpes virus closely associated with Burkitt's lymphoma, nasopharyngeal carcinoma, and infectious mononucleosis in humans. Immunologic studies have demonstrated circulating antibodies against EBV in serum from these patients, and tumor cells cultured from these patients release EBV. Anti-EBV antibodies have also been demonstrated in serum from patients with Hodgkin's disease and acute lymphocytic leukemia. Numerous epidemiologic studies have established a convincing association between herpes-simplex virus type 2 and cancer of the cervix. EBV can induce lymphoid tumors in monkeys, and a herpes virus from the New World squirrel monkey can induce tumors in owl monkeys and marmosets. (No references)

- 5402 ROLE OF EPIDEMIOLOGICAL STUDIES IN CANCER CONTROL. (Rus.) Bogovskii, P. A. (Lyon, France), G. Higginson and K. S. Muir. *Vopr Onkol* 19(8):103-110, 1973.

This review first discusses epidemiological studies which have attempted to demonstrate correlations between various forms of cancer and environmental factors. Difficulties in interpreting the findings of these studies include possible interrelationships of environmental factors or fortuitous associations. However, epidemiological studies of this kind have been very useful in establishing the etiology of various occupational cancers, e.g. stomach cancer in coal miners, lung cancer and mesothelioma in asbestos workers, etc. Retrospective studies have demonstrated associations between smoking and lung cancer, alcohol and esophageal cancer, asbestos and pleural and peritoneal mesothelioma, aniline dyes and bladder cancer, etc. Retrospective studies have also demonstrated the development of vaginal adenocarcinomas in young girls whose mothers had been given diethylstilbesterol during pregnancy and of leukemia in children whose mothers had influenza during pregnancy. Although the methodology used in prospective studies is less objectionable, they are difficult and time-consuming to carry out. The study of migrating populations can also reveal interesting information. In Japanese who migrated to the USA, the risk of developing stomach cancer slowly decreased while the prevalence of cancer of the large intestine increased quite rapidly. The risk of developing breast cancer remained low in Japanese women who migrated to the USA and in their daughters. These findings show that stomach cancer and cancer of the large intestine are caused by environmental factors, while breast cancer is caused by endogenous factors. The use of cancer registries as an epidemiological tool is considered. It is emphasized that in epidemiological studies the population and environ-

mental factors to be studied should be chosen properly and all methods, whether statistical, chemical, or other, should be standardized so that data can be compared. (29 references)

- 5403 THE FEASIBILITY OF PREVENTING THE EFFECTS OF CARCINOGENS ON MAN. (Rus.) Shabad, L. M. (Inst. Exp. Clin. Oncol., Moscow, USSR), K. Wittig and A. Ia. Khesina. *Kazan Med Zh* (5):92-93, 1973.

Measures are considered for reducing atmospheric levels of polycyclic aromatic hydrocarbons produced by domestic heating, industry, and motor vehicles. Older home heating systems should be replaced with ones which can burn fuel more efficiently. It is recommended that emissions from industrial sources, such as by-product coke plants, petroleum refineries, and plants producing carbon black, resins, and gas, should be reduced by the use of filters or by more complete combustion. The amount of polycyclic aromatic hydrocarbons in motor vehicle exhaust can be reduced by using oil additives, changing the ratio of gasoline to oil, and using "neutralizers", but more appropriate long-term solutions would be to use vehicles powered by gas or electricity. Since the largest amounts of benzpyrene (BP) are produced by idling motors, traffic flow should be improved by separating foot and automobile traffic. The amount of BP in airplane emissions has been reduced by more than 30% by adding magnesium to the fuel and by about 60% by using dearomatized fuels. To prevent lung cancer it is necessary to reduce the levels of not only carcinogens and cocarcinogens, but also of toxic substances, e.g. sulfur dioxide, oxides of nitrogen, and acrolein, which reduce ciliary activity in the bronchial epithelium. Since it is impractical to eliminate polycyclic aromatic hydrocarbons from the human environment at present, maximum permissible concentrations of BP have been established in the Soviet Union. They are 0.01 µg/100 m³ BP for the atmosphere and 15 µg/100 m³ in work places. (No references)

- 5404 EXCHANGE OF GENETIC INFORMATION IN THE CELL CYCLE. (Rus.) Luchnik, N. V. (Inst. Med. Radiol., Obninsk, USSR). *Dokl Akad Nauk SSSR* 212(4):985-988, 1973.

On the basis of information reported in the literature, a simplified model is presented to show how genetic information is exchanged during the cell cycle. Assuming that a chromosome is made up of two subchromatids, each of which consists of one DNA molecule, the first step (C₁) prepares the chromosome to divide and consists of close contact between the chromatids which are called conjugates. A follow-up step (P₁) follows during which heteroduplexes form and comparison and readjustment of the matrices occurs. Then synthesis (S) begins. After synthesis is complete, the basic patterns are monitored by a second conjugation (C₂) and a second follow-up stage (P₂) in which the new strands are compared with the old complementary parent strands. Mitosis

(M) occurs soon after the second follow-up is completed. This model explains why multistranded chromosomes behave as if they were one molecule in such phenomena as mutation, recombination and reduplication. Future articles will deal with experiments performed to test this hypothesis. (12 references)

- 5405 WHY AEROSOLS HAVE BECOME SUSPECT. CONCERN MOUNTS THAT SPRAYS POSE SIGNIFICANT CARDIAC, CANCER AND ACCIDENT DANGERS. (E.) Anonymous. *Med World News* 14(42):49-56, 1973.

There is some apparent evidence that pulmonary changes resulting from aerosol inhalation may be associated with the development of cancer. The presence of chronic obstructive lung disease in patients who do not smoke and who have no related occupational risk is often due to heavy use of aerosols. When the mouth and throat is sprayed with a radiopaque material as used in bronchiograms, the normal person will rid his system of it in 2 hr, but the person with aerosol-damaged lungs will still have the material 6 months later. Other lesions and heart strain have been observed resulting from this lung damage. It is suggested that the increased rate of lung cancer among women is due to increased use of aerosols. The highest occupational exposure to aerosols is likely incurred by beauticians. A study by the U.S. government is currently being conducted using pulmonary function tests on women working in this field. (No references)

- 5406 SOME ASPECTS OF THE CELLULAR AND HUMORAL IMMUNE RESPONSE TO TUMOR ANTIGENS. (E.) Hellström, K. E. (U. Washington Med. Sch., Seattle) and I. Hellström. *Triangle* 11(1):23-28, 1973.

Both cellular and humoral components are involved in the organism's immune response against neoplasms carrying tumor-associated antigens. The immunological defense against neoplasia is primarily mediated by immune lymphocytes. Lymphocyte mediated tumor cell destruction has been detected in both experimental animals and man. Autochthonous lymphocytes are reactive against the organism's neoplastic cells but not its normal cells and tumors of the same type cross-react antigenically. Sera from tumor-bearing animals and humans contain "blocking factors" that can abrogate killing of the respective target tumor cells by lymphocytes immune to their specific antigens; the blocking factors are probably complexes between antigens released from the tumors and antibodies formed by the host. There is an excellent correlation between the presence of blocking serum activity, as detected *in vitro*, and the presence of a growing tumor *in vivo* in both animals and humans. Evidence indicates that the lack of blocking activity in the sera from mice whose Moloney-virus-induced sarcomas have regressed is due to the presence of "unblocking" antibodies; the unblocking effect is specific. Unblocking antibodies have also been detected in rats and rabbits properly immunized against rat polyoma tumors and in some human patients whose tumors have either undergone spontaneous re-

gression or been surgically removed. Unblocking antibodies may offer some opportunities for tumor therapy. (27 references)

- 5407 MAREK'S DISEASE: A NEOPLASTIC DISEASE OF CHICKENS CAUSED BY A HERPESVIRUS. (E.) Nazerian, K. (Agricultural Res. Station, U.S. Dept. Agriculture, East Lansing, Mich.). *Adv Cancer Res* 17:279-315, 1973.

Marek's disease (MD), a lymphoproliferative disease of chickens characterized by lymphoid infiltration in the peripheral nerves and the development of lymphoid tumors in the viscera, is reviewed. The pathogenesis of the disease is discussed in terms of host susceptibility, clinical signs, gross lesions, and microscopic lesions, while its etiology is discussed in terms of the replication of the virus in chickens and cell culture and assay systems for the virus. The properties of the virus are considered in relation to morphology, physicochemical properties, the properties of the viral DNA, proteins, and antigens, and cross-reactions with other herpesviruses. Other topics include the effect of MD on the immune response of chickens, the role of humoral antibody against MD, the role of cell-mediated immunity against MD, vaccination against MD, and a comparison between the Marek's disease virus and Epstein-Barr virus. (139 references)

- 5408 HUMORAL RESPONSES IN TUMOR IMMUNITY: REVIEW OF EXPERIMENTAL FINDINGS. (E.) Mizejewski, G. J. (Dept. Biol., U. South Carolina, Columbia). *Am J Med Sci* 266(5):359-369, 1973

There are three main groups of tumor antigens: tumor-specific transplantation antigens (TSTA); tumor-associated antigens (TAA); and the fetal-embryonic antigens (FEA). The basic concepts of tumor immunology did not emerge until TSTA were distinguished from normal histocompatible transplantation antigens. Tumor-specific and/or associated antigen have been found in both chemically induced and spontaneously arising tumors; unlike the chemically induced tumors, the virus tumors possess cross-reacting surface antigens. The fundamental change in a cell seems to result in an alteration in the cell surface; this change could be an antigen gain or loss. Fetal cells and tissues and neoplastic tissues from heterogenic, allogenic, syngenic, and autochthonous sources are effective materials for immunization. Cellular and humoral factors are inherent in the concept of tumor immunology. With regard to cell-mediated immunity, sensitized lymphoid cells have destroyed tumor cells *in vitro*; the immune lymphocytes and humoral factors may interact to produce tumor or graft rejection. Humoral-mediated immunity involves: enhancing or blocking antibody, cytotoxic or nonblocking antibody, cytostatic antibody, and unblocking serum activity. The lymphoreticular system is considered by some to act as a surveillance system to protect the body from "non-self" entities. Several hypotheses have been put forth regarding tumor immunity. Radiolabeled antibodies have been beneficial in tumor treatment in instances of localization and, to a limited extent,

radiolabeled antibodies have been employed in humans for the diagnostic localization of tumors. The humoral antibodies produced against tumor agents provide an as yet untapped source of possible immunodiagnostic tools. (98 references)

5409 CHEMICAL CARCINOGENS AND THEIR MODE OF ACTION IN COLONIC NEOPLASIA. (E.)

Weisburger, J. H. (Natl. Cancer Inst., Bethesda, Md.). *Dis Colon Rectum* 16(6):431-437, 1973.

Epidemiologic considerations, geographic pathology, and migrant studies indicate that cancer of the lower bowel is mediated by environmental factors, presumably dietary; rectal cancer may be mediated by different etiologic factors. Although laboratory and domestic animals rarely develop rectal or colonic cancer spontaneously, various aromatic amines, β -glucoside, cycasin, 1,2-dimethylhydrazine, and azoxymethane can be used to induce tumors in these animals. Animal studies indicate that the intestinal microflora participate in the activation of these chemical carcinogens by liberating reactive intermediates from a conjugate. Thus, diet could modulate the effect of carcinogens on the gut via its influence on the microflora. Further experiments demonstrate that the activation of a procarcinogen can also take place in some regions of the lower gut via oxidation of a precursor in the intestinal mucosa. Hypotheses regarding the etiology of colonic cancer in man have suggested a connection between the intestinal microflora and the metabolism of bile acids or the excessive production of certain amines; these hypotheses merit further investigation. Additional investigative attention should also be given the observation that colonic cancer reflects a loss of certain key control systems, i.e., those governing DNA synthesis. (48 references)

5410 CLASSIFICATION OF IATROGENIC CARCINOGENESIS. (Ger.) Thomas, C. (Pathol. Inst., U. Freiburg im Breisgau, Germany). *Vehr Dtsch Ges Pathol* 56:126-132, 1972.

Tumors induced in man by radiation, drugs, or surgery are rare, but they do occur. Radiation has induced tumors in almost every organ, but the skin, bones, and thyroid are the most common sites. Leukemia can also develop after radiotherapy, e.g. after radiophosphorus therapy for polycythemia. Drugs which are known to induce tumors in man include N,N-bis(2-chloroethyl)-2-naphthylamine, mineral oil and vaseline contaminated with carcinogenic hydrocarbons, phenylbutazone, and smallpox vaccine. Some types of surgical procedures (orthopedic procedures employing metal and plastics, gastric resection, mastectomy, organ transplants) are also known to cause tumors or spread metastases. In addition, animal studies and clinical observations have suggested that a number of other drugs (alkylating cytostatic agents, urethane, isonicotinic acid hydrazide, griseofulvin, estrogens, etc.) may be carcinogenic. In prescribing these drugs, the benefits should be weighed against the risks. Experiments are described in which administration of oral contraceptives to female rats re-

duced the incidence of nephroblastomas induced by N-nitrosomethylurea but had no effect on the incidence of other malignancies. (45 references)

5411 GENETIC CONTROL OF MURINE VIRAL LEUKEMOGENESIS. (E.) Lilly, F. (Albert Einstein Coll. Med., Bronx, N. Y.) and T. Pincus. *Adv Cancer Res* 17:231-277, 1973.

The genetic control of murine viral leukemogenesis is reviewed. Early genetic studies of murine leukemia are discussed with regard to the high leukemia mouse strains, leukemogenesis in hybrids of high and low leukemic strains, and leukemia induced by various chemical and physical agents. The genetic control of Friend virus susceptibility is considered in terms of the host range of Friend virus, the genetic basis of the host range patterns, congenic strains for Friend virus susceptibility, the basis of focus formation by Friend virus, and other genes affecting Friend virus susceptibility. The genetic control of naturally occurring leukemia viruses is also discussed with attention to the susceptibility to leukemogenesis by naturally occurring viruses, tissue culture studies of naturally occurring leukemia viruses, and the genetic basis of N- and B-tropism of the Fv-1 gene. The H-2-linked genetic control of Gross virus and Friend virus leukemogenesis is also considered, as are genes affecting spontaneous and chemically induced leukemogenesis and genes determining leukemia virus-associated antigens. (148 references)

5412 CANCER AND THE IMMUNE RESPONSE. (E.) Prehn, R. T. (Inst. Cancer Res., Philadelphia, Pa.). *Proc Inst Med Chic* 29(10):339-345, 1973.

Arguments in favor of the concept of immunological surveillance rest largely upon correlations between varying levels of immune competency and the incidence of neoplasia. One such correlation is between neoplastic transformation and the appearance in the transformed cells of tumor regression antigens. While a cytotoxic immune reaction is the usual result of the immunization of syngeneic animals with tumors resulting from the action of strong chemical oncogens, radiation, or potent viruses used in the laboratory, spontaneous tumors commonly fail to elicit a specific immunological resistance in transplantation tests in syngeneic animals. Various lines of evidence argue against the notion that the minimal immune resistance in most spontaneous tumors is sufficient for the purposes of surveillance. A second correlation upon which the concept of immunological surveillance rests is that between experimental manipulations that interfere with allograft immunity and the susceptibility to tumor induction. With the possible exception of lung tumors, this correlation is very poor with regard to spontaneous tumors. Although there is a higher incidence of tumors among patients with naturally occurring immunodeficiency syndromes, increments in these tumors do not constitute good evidence for the failure of a normal surveillance mechanism. The same is true of miscellaneous correlations between

other factors (e.g., aging, caloric restriction) associated with altered immunocompetence and reduced or increased incidences of neoplasia. The interaction of the immune mechanism with the nascent spontaneous neoplasm is more likely to be stimulatory than inhibitory, making it unlikely that the allograft type of immune reaction (which is absent in invertebrates) evolved as a response to neoplasia. Thus, the immunological surveillance of nascent tumors may not exist in most tumor systems; instead, there is a late acting and inefficient immunological defense mechanism which may be subject to augmentation for the purposes of immunotherapy. (13 references)

5413 DIETARY HYPOTHESES AND DIET-RELATED RESEARCH IN THE ETIOLOGY OF COLON CANCER.

(E.) Berg, J. W. (Nat. Cancer Inst., Bethesda, Md.), M. A. Howell and S. J. Silverman. *Health Serv Rep* 88(10):915-924, 1973.

Epidemiologic data show a decrease in incidence of colon and rectal cancer among white females in the U.S. and a leveling off of rates for white males, with a decrease in mortality for these groups. In the black population, both incidence and mortality are increasing. For the white population, rates are higher in the North and West than in the South. For the black population, the total rate in the North exceeds that for whites, while the rates for the South and West are similar. Migrant studies show increased risk for bowel cancer among Polish and Japanese emigrants to the U.S. and among Americans moving from rural to urban areas. The epidemiology of large bowel cancer thus suggests that environmental factors such as diet are important in etiology. Current hypotheses link fats, animal protein, and refined carbohydrates to carcinogenic activity in the intestinal tract, primarily through the effect of diet on bacterial flora and intestinal motility. Confirmation of these hypotheses must await demonstration of dietary differences between bowel cancer patients and persons free of disease. (33 references)

5414 IMMUNOBIOLOGY OF GENITOURINARY TUMORS.

(E.) Lange, P. H. (Dept. Surg., U. Minnesota, Minneapolis), T. R. Hakala and E. E. Fraley. *Urology* 11(5):485-492, 1973.

Genitourinary tumors are reviewed with emphasis on immunological studies. Human tumor antigens appear to be "tissue-specific", that is, lymphocytes from a cancer patient will kill his own tumor cells or cells from other tumors of the same histologic type, but will not kill tumor cells of different histologic types. Specific tumors discussed include renal cell carcinoma, neuroblastoma, Wilms' tumor, transitional cell carcinoma, carcinoma of the prostate, and testicular tumors. Cell-mediated cytotoxicity in patients with transitional cell carcinoma appears to be related to clinical course, a finding that is contrary to results from studies on other human tumors where clinical correlations were related not to cell-mediated cytotoxicity but to accompanying serum elements. Although research in this area is

still in its infancy, the methodology of tumor immunology is becoming more sophisticated. For example the recently developed radioimmunoassay for alpha-fetoprotein, which has made determinations quantitative and 40 to 50 times more sensitive. (83 references)

5415 NATURALLY OCCURRING CHEMICAL CARCINOGENS.

(Cz.) Sula, J. (Fac. Gen. Med., Charles U., Prague, Czechoslovakia). *Chem Listy* 67(3):242-256, 1973.

Among carcinogens of bacterial origin are ethionine, a metabolite of various bacteria, including *Escherichia coli*; nitrosamines which are synthesized by bacteria from nitrates and nitrites in man; and condensed aromatic polycyclic hydrocarbons, particularly benzo(a)pyrene, which can be synthesized by soil bacteria. Among the carcinogenic products of molds and fungi are aflatoxins, sterigmatocystine, luteoskyrin, 4-methylnitrosoaminobenzaldehyde, griseofulvin and streptosotocin. Carcinogens synthesized by higher plants include cycasin, dimethylnitrosamine, retrosin, isatidin, lasiocarpin, methylprotoanemonin, parasorbic acid, thiourea and tannins. (108 references)

5416 IMMUNOLOGY OF GENITOURINARY TUMORS. (E.)

Guinan, P. (Cook Cty. Hosp., Chicago, Ill.), N. Sadoughi, I. M. Bush, T. John, F. Eghrari and R. J. Ablin. *Urology* 11(5):493-499, 1973.

There is a large body of evidence supporting the concept that urologic tumors are foreign to their hosts and that there is a continuous immunologic host-tumor interaction. Such evidence includes 1) the spontaneous regression, either of the primary tumor, or of metastases after removal of the primary tumor; 2) the survival of patients despite circulating tumor cells at the time of surgery; 3) the survival for prolonged periods of time in spite of incomplete removal of the primary tumor; 4) the increased incidence of neoplasia in immunosuppressed or immune deficient patients; 5) the presence of tumor at autopsy in patients without any previous clinical evidence of tumor; and 6) the wide variations in the course of different patients with the same types of tumor. Studies on these six factors in patients having tumors of the kidney, adrenal, bladder, prostate or testis are cited. (106 references)

5417 PREDICTIVE ONCOLOGY: (PART 2). (E.)

Bierman, H. R. (Loma Linda U. Sch. Med., Beverly Hills, Calif.). *Int Surg* 58(11):763-767, 1973.

The major epidemiologic and pathophysiologic factors associated with the following types of cancer are discussed: mammary, cervical, and endometrial carcinoma; carcinoma of the esophagus, stomach, colon, pancreas, adrenal cortex, and thyroid; leukemias and lymphomas; and cutaneous malignant melanoma. Certain cytopathological indicators can serve as preclinical evidence of an existent neo-

plasm; these include "ambiguous cells" in the sputum, unusual or metaplastic cells in the blood, elevated or reduced levels of leukocyte alkaline phosphatase, and increased frequency of partial leukocyte dysfunction against *Staphylococci aureus*. Xerography and thermography should frequently be performed to aid in the early diagnosis of mammary tumors, particularly if the patients are cancer susceptible. Biochemical parameters which are often associated with neoplastic conditions include: hyper- or hypouricemia; elevated or reduced copper and/or zinc levels; abnormal levels of lactic acid dehydrogenase or its isozymes, malic acid dehydrogenase, phosphohexose isomerase, aldolase, isocitric dehydrogenase, phosphatases, urinary alkaline phosphatase or alkaline phosphatase isozymes, regan isozyme, acid phosphatase, muramidase, or a wide variety of other enzymes, lipids, and lipoproteins; disorders of coagulation; and elevated urinary polyamines, gastrin, or calcitonin. (No references)

- 5418 PREDICTIVE ONCOLOGY: (PART 3). (E.)
Bierman, H. R. (Loma Linda U. Sch. Med., Beverly Hills, Calif.). *Int Surg* 58(11):768-773, 1973.

The incidence of malignancy in patients with primary immunodeficient disease is 100 times greater than in normal persons of the same age. Each type of immunodeficiency is associated with a distinctive spectrum of neoplastic diseases, although lymphomas, leukemias, and related lymphoreticular diseases are the major types of neoplastic diseases observed. In both humans and lower animals, the incidence of malignant neoplasms increases with age, presumably as immunologic vigor decreases. Immunocompetence can be estimated based on the previous immunologic history, the concentration of immunoglobulins, lymphocytes, eosinophils, and plasma cells, cell mediated immune responses, and the release of mediators of delayed hypersensitivity. The following disorders are associated with increased susceptibility to certain types of neoplastic disorders: appendectomy; drug addiction; Sjogren-Mikulicz syndrome; incompatible blood types with impaired immunocompetency; asthma and hives; primary and secondary acquired agammaglobulinemias; carpal tunnel syndrome; aniridia; idiopathic thrombocytopenic purpura; hypo- or hypergammaglobulinemia; independent synthesis of Bence Jones protein; cryoglobulinemia; cryofibrinogenemia; and cold agglutinins. In addition, there are five categories of tumor associated antigens: fetal antigens (alpha fetoglobulin, gamma fetoprotein, fetal reactive antigen, gastric tumor antigens, and carcinoembryonic antigen); glycolipids, particularly T-globulin; viral antigens; sarcoma antigens; and ABH antigens. Both the ABO and HLA systems exert an influence on the susceptibility to choriocarcinoma, the former exerting the strongest influence. The HLA system also appears to play a role in the susceptibility to Hodgkin's disease, which has its tumor associated antigens. Other tumor associated antigens have been discovered in conjunction with hepatocellular carcinoma, malignant melanoma,

carcinoma of the pancreas, and astrocytoma. An intradermal cancer tests described by Makari is reported to demonstrate cancer specific antigens in 97% of patients with carcinomatous disease. (No references)

- 5419 INPUT AND OUTPUT OF GENETIC MATERIAL IN CELLS PRODUCING C-TYPE RNA VIRUSES. (E.)
Hill, M. (Dept. Cell and Molecular Biol., Inst. Cancer, Immunogenetics, Villejuif, France). *Biomedicine* 18(6):453-458, 1973.

Available evidence concerning the interaction between the genome of an RNA tumor virus and that of infected cell is reviewed. Infectious viral particles contain RNA-dependent DNA polymerase which transcribes viral RNA to DNA. In infected cells, the DNA complementary to a portion or to an entire viral genome becomes integrated into the cellular genetic material and can be shown to be infectious proviral DNA by its capacity to infect permissive cells. It appears, however, that even uninfected cells contain the endogenous C-type virus genome (perhaps identical with DNA sequences hybridizing with viral RNA *in vitro*) which can be activated upon induction to give rise to C-type particles. Further data are required in order to understand the interactions of oncogenic viruses in animal cells in greater depth. (90 references)

- 5420 REVERSE TRANSCRIPTASE AND NEOPLASIA. (E.)
Gallo, R. C. (Natl. Cancer Inst., Lab. Tumor Cell Biol., Bethesda, Md.). *Biomedicine* 18(6):446-452, 1973.

Reverse transcriptase, the DNA polymerase of type-C RNA tumor viruses, can be distinguished from the DNA polymerases of normal cells using biochemical and immunological approaches. The enzyme is required for formation of the provirus, the RNA tumor viruses, and hence, for the infection of cells by these viruses. Reverse transcriptase from these viruses appears to be coded for by the viral genome. When properly characterized it can be used as a biochemical marker for the presence of these viruses or virus components in cells. A reverse transcriptase related to the reverse transcriptase of type-C RNA tumor viruses (leukemia-lymphoma-sarcoma complex) has been unequivocally demonstrated in some human acute leukemic cells, and its presence has been suggested by more preliminary evidence in some other human cancers. Its presence in some embryonic tissues at some stages of differentiation or in the immune response has also been suggested, but there is evidence that in these situations the enzyme is not the same as the reverse transcriptase of type-C viruses. Viral reverse transcriptase has also become a practical tool not only for the detection of viral components in cells, for quantitation of virus, and for advancing conceptual understanding of viral replication but also in molecular biology to make labeled DNA transcripts of cell mRNA for use as molecular probes to determine the presence and concentration of various cell mRNAs in tissues of different types. It has for instance been very use-

ful in the demonstration that globin beta chain mRNA molecules are deficient in beta thalassemia. (59 references)

- 5421 HODGKIN'S DISEASE: INVOLVEMENT OF VIRAL AGENTS IN THE ETIOLOGY. (E.) Sinkovics, J. G. (U. Texas, M. D. Anderson Hosp., Houston) and F. Györkey. *J Med* 4(5):282-317, 1973.

The pathological and clinical aspects of Hodgkin's disease (HD) remain descriptive, but better understanding of the pathogenesis seems to emerge from immunological and virological studies. Radio- and combination chemotherapy offer potential for cures in the future, especially if these two types of treatment could be effectively combined. An immunological conflict within the lymphatic tissues appears to occur in HD. Whether this process is the result of a viral infection in which antigenic changes coded for by the viral genome develop or whether this immunological process permits superinfection with passenger viruses or with specific oncogenic virus or, instead, activates the preexisting latent genome of such viruses is not known. The overt production of mature virions in HD is rare and its occurrence would suggest superinfection with a passenger virus (e.g., varicella-zoster virus). On the other hand, strong evidence for the existence of viral genomes of different types (herpes-type; oncornavirus; papovavirus) in patients with HD has recently been provided. An etiological role of these viruses separately or in unison has been suggested but has not as yet been proven. (168 references)

- 5422 HEREDITARY ADENOMA DISEASES OF THE LARGE INTESTINE. (Ger.) Hassan, A. (Med. Fac., Technical Coll., Aachen, Germany) and J. Wedell. *Dtsch Med Wochenschr* 98(45):2150-2153, 1973. (40 references)

- 5423 MULTIPLE PRIMARY MALIGNANT NEOPLASMS. (Pol.) Montowska, L. (Acad. Med., Bydgoszcz, Poland) and B. Romanski. *Pol Tyg Lek* 28(32):1245-1248, 1973. (23 references)

- 5424 MOLECULAR BIOLOGICAL MECHANISMS INVOLVED IN VIRAL TUMORIGENESIS. (Rus.) Shliankevich, M. A. (Inst. Exp. Clin. Oncol., Moscow, USSR). *Vest Akad Med Nauk SSSR* (4):82-90, 1973. (63 references)

- 5425 MALIGNANT LIVER TUMORS. (Fl.) Drieskens, L. (St. Raphael Hosp., Louvain, Belgium), J. Fevery and J. de Groote. *Tijdschr Gastroenterol* 15(5):346-370, 1972. (67 references)

- 5426 THE CRITERIA OF IDENTIFICATION OF POPULATION GROUPS AT HIGH-RISK FOR MALIGNANT TUMORS OF THE MAIN LOCALIZATIONS. (Rus.) Pavlov, K. A. (N. N. Petrov Res. Inst. Oncol., Leningrad, USSR), D. P. Berezkin, N. Y. Shabashova and K. S. Mirotvortseva. *Vopr Onkol* 19(10):105-110, 1973. (41 references)

- 5427 CANCER OF THE BREAST IN PREGNANCY AND LACTATION. (E.) Cheek, J. H. (Baylor U. Med. Ctr., Dallas, Tex.). *Am J Surg* 126(6):729-731, 1973. (18 references)

- 5428 EFFECT OF ULTRAVIOLET LIGHT ON THE SKIN. (E.) Al Hajj, G. (West Virginia U. Sch. Med., Morgantown), Amanollah-Shafee and E. S. La Plante. *W Va Med J* 69(12):351-352, 1973. (29 references)

- 5429 RENAL CELL CARCINOMA: REVIEW OF 26 YEARS OF EXPERIENCE AT THE OCHSNER CLINIC. (E.) Ochsner, M. G. (Ochsner Clin., New Orleans, La.), W. Brannan, H. S. Pond, III and E. H. Goodier. *J Urol* 110(6):643-646, 1973. (27 references)

- 5430 INFLUENCE OF HORMONES AND CHEMICAL CARCINOGEN ON MURINE LEUKAEMIA. (E.) Karande, K. A. (Cancer Res. Inst., Bombay, India) and K. J. Ranadive. *Br J Cancer* 28(4):299-309, 1973.

Leukemogenesis induced with chemical carcinogens and hormones was studied in intact and ovariectomized mice of the ICRC strain, which is susceptible to the spontaneous development of both breast cancer and leukemia, and the Strong A strain, which is susceptible only to breast cancer. Estradiol was administered to ovariectomized females at a dose level of 1 µg/day or 10 µg/day for 30 days; another group received 1 µg estradiol per day plus 1 mg progesterone per day for 30 days. In one group, two pituitaries from syngeneic male mice were implanted s.c. on the right inguinal pair of mammary glands of each female. All animals were force fed 20-methylcholanthrene (20-MCA) once weekly for 8 wk. The 20-MCA enhanced leukemogenesis in the intact ICRC mice, but not in the ovariectomized animals. However, treatment with estradiol and/or progesterone increased the incidence and latent period of leukemia in the ovariectomized females, as did the pituitary grafts. Although 20-MCA produced leukemia in the Strong A ovariectomized mice, further hormone or pituitary treatment failed to increase the incidence. The highest incidence of leukemia in this strain was seen in the group treated with both estradiol and progesterone. Although all of the lesions produced by the carcinogens in this study were lymphocytic neoplasms, the type of leukemic lesions in the Strong A strain differed from that seen in the ICRC strain; localized thymic tumors were absent in the Strong A strain, but were common in the ICRC mice. A rare type reticulum cell neoplasm leukemic lesion was observed in a few Strong A females. A paucity of viral particles was conspicuous in the spontaneous lesions of the ICRC mice. In 20-MCA treated intact and castrated females as well as in the pituitary transplant group, type C and intracisternal type A particles were present. However, only intracytoplasmic type A particles were found in the tissues of castrated mice treated with estradiol and/or progesterone.

- 5431 EARLY CHANGE IN THE BLADDER MUCOSA OF RATS IN CARCINOGENESIS WITH N-BUTYL-N-BUTANAL (4)-NITROSAMINE: MULTICENTRIC DEVELOPMENT OF BLADDER TUMORS. (Ger.) Riedel, B. (Urology Clinic, Free U. Berlin, Germany) and R. Piper. *Urol Int* 28(3/5):322-327, 1973.

Administration of N-butyl-N-butanal (4)-nitrosamine (dose and route of administration not specified) to Wistar rats induced bladder tumors in all animals within six months. After one month, the thickness of the transitional epithelium had increased from 3-4 to 5 layers of cells. After nuclei became pyknotic, desquamation of the epithelial cells occurred. After two months, vessels of the lamina propria had infiltrated into the epithelium and in some places papillary transformation of the mucosa had occurred. All cells in these bladder papillomas were diploid. In contrast to the normal epithelium, superficial cells synthesized DNA and underwent

mitosis long before tumors formed. These hyperplastic changes in the bladder epithelium persisted and involved the entire inner surface of the bladder. This hyperplasia might form a basis for multicentric development of bladder tumors and account for the high recurrence rate of these tumors.

- 5432 METABOLISM OF POLYCYCLIC AROMATIC HYDROCARBONS IN CULTURED HUMAN LEUKOCYTES UNDER GENETIC CONTROL. (E.) Kellerman, G. (Dept. Biol., U. Texas, Houston), M. Luyten-Kellerman and C. R. Shaw. *Humangenetik* 20(3):257-263, 1973.

The metabolism of the polycyclic hydrocarbon benzo(a)-pyrene (BP) to water-soluble products was measured in cultured human leukocytes from 35 healthy adults. Two methods were used for determining the degree of hydrocarbon metabolism, the results from the two showing virtually 100% agreement. The subjects were divided into three categories with respect to BP metabolism response to aryl hydrocarbon hydroxylase (AHH) induction: 51% belonged to group 1 with low inducibility and slow metabolism; 43% belonged to group 2 with intermediate inducibility and metabolism; and 6% belonged to group 3 with high inducibility and high metabolism. These figures are in good agreement with those from a population study involving 161 subjects. The lymphoblast is probably the principal cell type responsible for the mixed function oxidase activity. For all three groups, dibenz(a,h)anthracene (dBA) was a more potent inducer than 3-methylcholanthrene (3MC). In a separate study, the extent of induction by phenobarbital (PB) paralleled that by dBA and 3MC, although the extent was less pronounced with PB. These data indicate that in cultured human leukocytes, the degree of metabolism of polycyclic aromatic hydrocarbons, drugs, and steroids is under genetic control. They also indicate that people with intermediate or high inducibility should be more susceptible to chemical carcinogenesis than subjects with low inducibility.

- 5433 MALIGNANT MOUSE-LIVER TUMORS RESEMBLING HUMAN HEPATOBLASTOMAS. (E.) Turusov, V. S. (International Cancer Res. Agency, Lyon, France), M. K. Deringer, T. B. Dunn and H. L. Stewart. *J Natl Cancer Inst* 51(5):1689-1695, 1973.

Seventy-five liver tumors resembling human hepatoblastomas were found in male CF-1 mice, some of which had been treated DDT. The incidence was 0.9% in the untreated animals and 3.8% in the treated animals. Twenty-four similar tumors were found in untreated male and female (YBR X AKR)_{F1} and (DBA/2-X YBR)_{F1} mice, the incidence being 6%. The neoplasms were invariably found in older animals (mice dying after 70 wk of age) and were almost invariably associated with the ordinary type of hepatoma. Of the 75 tumors in the CF-1 mice, 15 metastasized to the lungs and 1 also metastasized to a mediastinal lymph node and the wall of the bladder. Pulmonary nodules representing metastases of the hepatoblastomas and ordinary hepatomas were found in three of the YBR hybrids. Histologically, the vascular

component of the hepatoblastoma was prominent in many neoplasms and organoid structures composed of undifferentiated cells were arranged around vascular channels or formed rows and rosettes. Osteoid formations were observed in four neoplasms. Large hemorrhages, necrosis, fibrosis, and thick capsules were frequently encountered. Despite morphological similarities to human hepatoblastomas, the murine hepatoblastomas also showed dissimilarities in that they were much more dedifferentiated, seldom contained bone, and never contained cartilage.

5434 AUTOPSY FINDINGS ON THE CARCINOGENIC ACTION OF COUMARIN IN AN ANIMAL EXPERIMENT.

(Ger.) Griepentrog, F. (Pettenkofer Inst., Fed. Hlth. Service, Berlin-Lichterfelde, Germany). *Toxicology* 1(2):93-102, 1973.

Diets containing 0.1-0.6% coumarin were fed to male and female albino rats for up to two yr. Carcinomas of the bile ducts developed in 12 of the 14 survivors given 0.5% coumarin. Because they ate only about half of their rations, bile duct carcinomas developed in only 5 of 25 survivors fed 0.6% coumarin. A few small benign bile duct adenomas and bile duct proliferation were observed in rats given 0.1% and 0.25% coumarin. At autopsy small to massive grayish-white tumor nodules were found on the surface of the liver; no evidence of cirrhosis was detected. Cellular and nuclear atypia, infiltrative and destructive growth in the liver tissue, bile duct-like structures, and the absence of bile pigment demonstrated that these tumors were bile duct carcinomas. None of the controls developed these tumors.

5435 ROLE OF PROGESTERONE IN THE DEVELOPMENT OF VAGINAL, CERVICAL AND ENDOMETRIAL CANCER IN MICE. (Fr.) Reboud, S. (U. Hosp. Ctr., Besancon, France) and G. Pageaut. *Ann Anat Pathol (Paris)* 17(2):187-198, 1972.

Threads coated with 5-10 mg of 3-methylcholanthrene (MC) were implanted into the cervical canals of 100 female C57B16 mice by ligating them to the uterine bifurcation. In addition, 50 of these mice received implants of progesterone (15 mg s.c. in a Polyox WSRN 750 excipient) every three wk for nine wk. Controls consisted of 25 untreated mice and 25 mice given progesterone alone. Progesterone alone increased mucus production in the vagina and cervix; many cystic glands and a fibrous chorion developed in the uterus. Of the 50 mice given MC alone, 21 developed precancerous lesions of the vagina and exocervix and 23 developed precancerous lesions of the endocervix. Carcinomas *in situ* developed in the vagina and exocervix of three mice and in the endocervix of 13, while invasive carcinomas developed in the vagina and exocervix of one mouse and in the endocervix of three. Of the 50 mice given MC + progesterone, 17 developed precancerous lesions in the vagina and exocervix and eight developed precancerous lesions of the endocervix. Vaginal and exocervical carcinomas *in situ* developed in 14 mice and endocervical carcinomas *in situ* in 11. Invasive

carcinomas developed in the vagina and exocervix in 15 and in the endocervix of 30 mice. Statistical analysis demonstrated that progesterone significantly increased the incidence of invasive epidermoid carcinomas of the vagina and cervix in mice treated with MC and favored development of more mature, mucoepidermoid tumors. Endometrial metaplasia occurred in 11 mice given MC alone and in only three of those given MC and progesterone. Invasive endometrial tumors (eight adenoacanthomas and three epidermoid carcinomas) developed in 11 mice given MC alone and in only one given MC and progesterone. These differences were highly significant. Endometrial sarcomas developed in three mice given progesterone and MC but in none of those given MC alone.

5436 CARCINOGENIC ACTIVITY OF *PETASITES JAPONICUS* MAXIM., A KIND OF COLTSFOOT. (E.)

Hirono, I. (Gifu U. Sch. Med., Japan), M. Shimizu, K. Fushimi, H. Mori and K. Kato. *Gann* 64(5):527-528, 1973.

Two groups of ACI rats were fed a diet containing 4% *Petasites japonicus* Maxim., a kind of coltsfoot used as a food and herbal remedy in Japan. After 6 months, the first group was put on a regime on which they received an 8% coltsfoot diet for 1 wk, followed by a 0% coltsfoot diet the next wk, etc.; the second group continued on the 4% coltsfoot diet, while a third group received a normal diet. Within 480 days from the start of the experiment, 3 Group 1 animals developed hemangioendothelial sarcomas of the liver, 6 animals developed liver cell adenomas, and 2 developed hepatocellular carcinomas. Of the Group 2 animals, 8 developed hemangioendothelial sarcomas, 4 developed liver cell adenomas, and 1 developed a hepatocellular carcinoma. None of these tumors were found in the control animals. Four of the 11 animals with hemangioendothelial sarcoma showed metastases in the lung or perihepatic lymph nodes. There were no significant sex differences in the incidence of tumor development. Thus, the flower stalk of *Petasites japonicus* is carcinogenic.

5437 ELIMINATION BY THE CARCINOGEN DIETHYLNITROSAMINE OF NON-SPECIFIC INHIBITORY FACTORS IN THE REGENERATING LIVER. (E.) Wayss, K. (German Cancer Res. Ctr., Heidelberg, W. Germany), J. Mattern and M. Volm. *Exp Pathol (Jena)* 8(5-6):384-385, 1973.

The effect of liver cell extracts from diethylnitrosamine (DENA) treated male Sprague Dawley rats on ³H-thymidine incorporation into DNA of regenerating rat liver was studied *in vivo*. Liver extracts were prepared according to a previously published method designed to extract "epidermal chalones". S.c. injection of such extracts 2 hr before partial hepatectomy prevented the 80-90% decrease in the rate of ³H-thymidine incorporation into hepatocyte DNA and the 15-30% decrease into kidney cell DNA produced by liver extracts from untreated controls. Maximum reversal effects of the hepatocyte extract from DENA-treated rats was observed for those samples extracted between 12-16 hr after DENA injection.

This inactivation of the inhibitory effect was reversible. It was thus concluded that the effect of DENA is due to the inactivation of nonspecific tissue inhibitory factors.

5438 INHIBITION OF TUMOR INITIATION AND PROMOTION BY ANTI-INFLAMMATORY AGENTS. (E.)

Slaga, T. J. (Fred Hutchinson Cancer Res Ctr., Seattle, Wash.) and J. D. Scribner. *J Natl Cancer Inst* 51(5):1723-1725, 1973.

Two nonsteroidal anti-inflammatory agents, Tandearil, 1-phenyl-2-(p-hydroxyphenyl)-3,5-dioxo-4-n-butylpyrazolidine monohydrate and W2354, 7-chloro-3,3a-dihydro-2H,9H-isoxazolo (3,2-b)(1,3-benzoxazin-9-one), greatly reduced, but did not completely suppress, tumor promotion in the skin of female Charles River CD-1 mice caused by the croton oil factor 12-O-tetradecanoylphorbol-13-acetate (TPA). The steroidal anti-inflammatory agent, dexamethasone, markedly reduced tumor initiation by 3-methylcholanthrene (MCA) and reduced complete carcinogenesis by MCA. The previously noted weight loss caused by dexamethasone treatment did not occur with the nonsteroidal anti-inflammatory agents. Tandearil also lacked the immunosuppressant activity of dexamethasone and the effects of dexamethasone on the adrenal-pituitary system. The studies conducted suggest that complete carcinogenesis by MCA consists of a continuing summation of initiated cells, propagated by the mild hyperplasia produced by the carcinogen. It is therefore suggested that small amounts of hydrocarbon combined with a continuing promoting stress may be much more damaging to the population than much larger amounts of hydrocarbon in the absence of promoters. The reduction of various pollutants in the human environment is urged.

5439 THE INFLUENCE OF LIVER REGENERATION ON THE STABILITY OF 7-METHYLGUANINE IN RAT LIVER DNA AFTER TREATMENT WITH *N,N*-DIMETHYLNITROSAMINE.

(E.) Capps, M. J. (Paterson Labs., Manchester, England), P. J. O'Connor, and A. W. Craig. *Biochim Biophys Acta* 331:33-40, 1973.

The rate of loss of 7-methylguanine from the liver DNA of adult rats injected with single 2 mg/kg doses of *N,N*-di-(¹⁴C)methylnitrosamine was determined following partial hepatectomy. (5-³H)orotic acid was administered to the animals as neonates to label the liver DNA and facilitate observation of the dilution of methylated DNA with newly synthesized material. At the time of partial hepatectomy, very little metabolic incorporation of radioactivity into liver purines had occurred. However, 3 days after hepatectomy the amount of 7-(¹⁴C)methylguanine had decreased to 30% that observed at the time of the operation; a similar decrease was noted in the amount of ³H label in the liver DNA. Between 3 and 9 days after partial hepatectomy, the amount of 7-(¹⁴C)methylguanine continued to decrease, while that of tritium remained relatively constant. Thus, the drop in the percentage of guanine methylated during liver regeneration could be explained in terms of the normal rate of loss of 7-methylguanine from DNA

and dilution of the methylated DNA with newly synthesized material. It is concluded that events occurring in the cell cycle do not accelerate the loss of 7-methylguanine from rat liver DNA and that methylated DNA can replicate in the usual way.

5440 THE INFLUENCE OF CALCIPARIN ON DIETHYLNITROSAMINE-INDUCED LIVER TUMORS IN THE RAT.

(Ger.) Platt, D. (Med. Clinic, Justus Liebig U., Giessen, Germany) and F. J. Hering. *Arzneim Forsch* 23(7):956-961, 1973.

Male rats were given diethylnitrosamine (DENA; 5 mg/kg/day p.o. through a stomach tube for an average of 85 ± 10 days; mean total dose 436 ± 90 mg/kg), either alone or in combination with Calciparin (calcium heparinate; 1.56.25 IU/day, 312.5 IU/48 hr, or 625 IU/72 hr). Biochemical and histochemical determinations were made of the activities of hyaluronidase, β-glucuronidase, and β-acetylglucosaminidase in the tumor center, tumor periphery, and tumor-free liver tissue of rats with DENA-induced hepatomas and in liver tissue from normal controls. In general, the activities of these three enzymes was significantly higher in the tumor periphery than in tumor-free liver tissue in rats with DENA-induced hepatomas or in normal liver tissue from controls. A significant decrease in the number of tumors was found in DENA-treated rats given Calciparin. Hyaluronidase and β-glucuronidase activities were significantly decreased in Calciparin-treated rats, and the activities of β-glucuronidase and β-acetylglucosaminidase were higher in the tumor periphery than in the tumor center or tumor-free liver tissue. These findings suggest that the lysosomal activities of these glucosaminoglycan hydrolases may play a role in the infiltration of DENA-induced hepatomas.

5441 EFFECT OF ALKYLDISULFONES ON THE SYNTHESIS OF THE CARCINOGENIC METABOLITE OF 2-ACETYLAMINOFLUORENE.

(Rus.) Pliss, G. B. (N.N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR), V. K. Gorkalo and A. S. Petrov. *Vopr Onkol* 19(11):43-47, 1973.

Male albino rats were injected i.p. with 1/20 of the LD₅₀ of dimethylsulfoxide (DMSO) 2 hr before administration of one of 12 alkyldisulfones (doses not specified) and 2-acetylaminofluorene (AAF; 100 mg/kg i.p. in a DMSO solution). Inhibitory effects of alkyldisulfones on AAF oxidation were evaluated by measuring urinary excretion of the carcinogenic metabolite, N-hydroxy-AAF, after water loading. The compounds tested had the general formula R-CH₂CH₂-X-(CH₂)_n-X-CH₂CH₂-R in which R was CH₃COO-, HO-, C₆H₅CO- or C₆H₅CH₂CO-; X was S, SO or SO₂; and n was 1, 2, 3 or 4. The strongest inhibitor of AAF metabolism was (CH₃COOCH₂CH₂SO₂)₂CH₂ which caused a decrease in urinary excretion of N-hydroxy-AAF to 1/10 of its normal value. The inhibitory activity of these compounds decreased as the number of methylene groups between the sulfur atoms increased. In the acetylenethoxysulfone series, the distance between sulfur atoms was the factor determining inhibitory

activity, the optimum distance being one or two methylene groups. Compounds in which $X = SO_2$ more effectively inhibited AAF metabolism than those in which $X = S$. Compounds with phenyl groups were poor inhibitors, probably because these compounds undergo hydroxylation to form phenols. Two ethoxy analogues of alkyl disulfones were relatively effective inhibitors of AAF metabolism, the more effective being a compound with four carbon atoms between the sulfonyl radicals. It is suggested that these hydrophilic compounds are bound to the reduced form of cytochrome P-450, while the hydrophobic alkyl disulfones react with the oxidized form. The failure of two compounds in which R was a vinyl group to inhibit AAF metabolism may be due to their reactions with compounds, other than cytochrome P-450, which contain nucleophilic centers. Determinations of cytochrome P-450 and B₅ in liver mitochondria demonstrated that the action mechanisms for acetyl and ethoxy derivatives of the alkyl disulfones are different. Cytochrome B₅ apparently does not take part in hydroxylation of AAF but is involved in other metabolic processes.

5442 THE EFFECT OF X-IRRADIATION ON HYDROCARBON METABOLISM AND ON HYDROCARBON-INDUCED LETHALITY AND TRANSFORMATION IN CELLS DERIVED FROM MOUSE PROSTATE. (E.) Marquardt, H. (Memorial Sloan-Kettering Cancer Ctr., N. Y.). *Z Krebsforsch* 80(3):223-228, 1973.

M 2 cells derived from C 3 H mouse prostate were X-irradiated (250 r) 48 hr before treatment with 3-methylcholanthrene, 7,12-dimethylbenz(a)anthracene, the K region epoxide of 3-methylcholanthrene, or N-methyl-N'-nitro-N-nitrosoguanidine. The lethality induced by 3-methylcholanthrene and 7,12-dimethylbenz(a)anthracene is decreased, that induced by the K-region epoxide of 3-methylcholanthrene is significantly increased, and that induced by N-methyl-N'-nitro-N-nitrosoguanidine is not altered. The effect of prior X-irradiation on the rate of malignant transformation *in vitro* is as follows: that caused by 3-methylcholanthrene is markedly decreased, that caused by the K-region epoxide of 3-methylcholanthrene is significantly increased, while that caused by dimethylbenz(a)anthracene or by N-methyl-N'-nitro-N-nitrosoguanidine is not influenced. The data suggest that the effect of X-rays on methylcholanthrene-induced transformation *in vitro* is due to altered methylcholanthrene metabolism.

5443 THE MECHANISMS OF ACTION OF THE CARCINOGENIC NITROSO AND RELATED COMPOUNDS. (E.) Schoental, R. (Royal Vet. Coll., London, England). *Br J Cancer* 28(5):436-439, 1973.

It is suggested that the carcinogenic action of the alkylnitrosamines is mediated by their respective alkylnitrosamino aldehydes, which may be intermediate oxidation products between the alcoholic and carboxylic metabolites. Such metabolite aldehydes would resemble the alkylnitrosourethanes in action. Alcoholic and carboxylic nitrosamino metabolites are excreted in the urine, indicating that the alkylnitrosamino moiety can survive metabolic oxidation.

With regard to the aldehydic derivatives, it is possible that at a particular stage of the cell's existence, chromatin may assume a conformation in which a free amino group of a nucleic acid base could be present in close vicinity to two thiols of peptide chains. Such a conformation would allow the aldehydic carbonyl to condense with the amino group to form a Schiff base type of bond, while the thiols could reduce the nitroso group and form covalent bonds. As a result, a firm "bridge" (possibly in the form of a 6 or 7 membered ring) would bind the nucleoprotein with the nucleic acid. Such binding may be irreversible, irreparable, and have long-lasting consequences. These consequences are a rare cellular event, possibly because of the stringent conditions under which such interactions could take place.

5444 POLYRIBOINOSINIC-POLYRIBOCYTIDYLIC ACID PREVENTS CHEMICALLY-INDUCED MALIGNANT TRANSFORMATION *IN VITRO*. (E.) Marquardt, H. (Mem. Sloan-Kettering Cancer Ctr., New York, N.Y.). *Nature [New Biol]* 246(155):228-229, 1973.

The effect of polyriboinosinic-polyribocytidylic acid (poly(rI)·poly(rC)) was studied on the *in vitro* transformation of cloned C3H mouse fibroblasts by dimethylbenz(a)anthracene (DMBA) or N-methyl-N-nitro-N-nitrosoguanidine (MNNG). Poly(rI)·poly(rC), at a concentration (10 µg/ml) which induced interference and inhibited *in vitro* virus production, completely blocked DMBA- and MNNG-induced transformation when added to cells 24 hr before, at the same time as, or 3 days after carcinogen treatment. Addition of 250 U/ml mouse interferon to cultures following 24 hr treatment with DMBA or MNNG failed to inhibit transformation although it did stimulate intracellular metabolism of DMBA. These results suggested that poly(rI)·poly(rC) probably does not inhibit DMBA- or MNNG-induced transformation by stimulating production of interferon with antiviral activity.

5445 A RAT MODEL FOR STUDYING COLONIC CANCER: EFFECT OF CHOLESTYRAMINE ON INDUCED TUMORS. (E.) Nigro, N. D. (Dept. Surg., Wayne State U., Detroit, Mich.), N. Bhadrachari and C. Chomchai. *Dis Colon Rectum* 16(6):438-443, 1973.

Male Sprague-Dawley rats were given weekly s.c. injections of dimethylhydrazine (15 mg/kg) or azoxymethane (8 mg/kg), which were continued until the animals died or appeared moribund. Ninety-one intestinal tumors developed in 20 of the 24 rats treated with dimethylhydrazine; the average number of tumors per rat was 4.5. All of the animals treated with azoxymethane developed intestinal tumors; the total number was 131, with an average of 5.5 per rat. There were as many or more tumors in the small bowel as in the large bowel, with each carcinogen inducing a preponderance of tumors in the proximal half of each segment of the intestinal tract. Occasional tumors were also found in the lung, liver, kidney, ear, and site of injection. In a second experiment, one group of rats was treated s.c. with dimethylhydrazine, a second was

treated with azoxymethane, and a third was treated with methylazoxymethanol; half of each group received cholestyramine in their diet. In the no cholestyramine group, the number and distribution of tumors was the same as in the first experiment; 60% of the methylazoxymethanol treated animals developed tumors. The cholestyramine fed group developed significantly more tumors than the no cholestyramine group, with the increased tumor formations occurring predominantly in the distal half of the large intestine. The tumors in the cholestyramine fed animals were also larger and predominantly sessile as opposed to the tumors in the no cholestyramine group, which were predominantly polypoid. The rat given azoxymethane s.c. at weekly intervals while on a 2% cholestyramine diet is an excellent experimental model for studies of colonic cancer.

- 5446 NITRITES IN FOODS. (E.) Lijinsky, W. (Biol. Div., Oak Ridge Natl. Lab., Tenn.). *Science* 182(4118):1194-1196, 1973.

In a letter to the editor, the author takes exception to a suggestion in an earlier letter by A. E. Wasserman and L. A. Wolff that the potential carcinogenic hazard of food nitrites is overstated. The problem of *in vivo* formation of carcinogenic nitrosamines from nitrites used as preservatives in many foods possibly represents the greatest hazard to the public and cannot be ignored. The limit of 200 ppm of residual nitrite in food set by legislation in 1926 is arbitrary and should be greatly decreased in light of the fact that modern processing techniques have reduced this value to as little as 10 ppm in some hams and lunch meats. The fact that animal studies have shown that nitrosamines possess carcinogenic activity coupled with the fact that nitrosamines can be produced *in vivo* from nitrites, argues for the total elimination of nitrites from all foods until such time as they may be shown to be absolutely safe for human consumption.

- 5447 INHIBITION OF POST-REPLICATION REPAIR OF ALKYLATED DNA BY CAFFEINE IN CHINESE HAMSTER CELLS BUT NOT HeLa CELLS. (E.) Roberts, J. J. (Chester Beatty Res. Inst., London, England) and K. N. Ward. *Chem Biol Interact* 7(4):241-264, 1973.

The effects of caffeine were studied on DNA repair in and survival of cultured Chinese hamster (CH) and HeLa cells treated with sulfur mustard (SM) or *N*-methyl-*N*-nitrosourea (MNU). Caffeine (0.75mM) potentiated the lethal effects of SM and MNU on CH cells but not on HeLa cells. Studies in which cells were synchronized by mitotic harvest and treated with carcinogen and caffeine starting in G₁ phase showed that the sensitization of SM- but not MNU-treated cells was S phase specific. The maximum effect in SM-treated cells lasted for 24 hr in asynchronized cultures, whereas that in MNU-treated asynchronized cultures lasted for up to 50 hr after initial alkylation. Measurement of the rate of incorporation of ³H-thymidine or ³H-5-bromodeoxyuridine into DNA of SM or MNU plus caffeine-treated cultures indicated that caffeine acted by reversing the alkyla-

tion-induced delay of DNA synthesis in CH cells, but not in HeLa cells. Surprisingly, caffeine had no inhibitory effect on DNA repair and actually produced a slight stimulation. The possibility that repair synthesis was being modified by caffeine in some way so that the process was less effective could not be excluded.

- 5448 SURFACE BEHAVIOR OF DIBENZANTHRACENE WITH LIPID MONOLAYERS. (E.) Belmonte, A. A. (Sch. Pharmacy, U. Connecticut, Storrs) and J. Swarbrick. *Biochim Biophys Acta* 323:647-652, 1973.

Insoluble monolayer films of lecithin and lecithin-cholesterol mixtures were prepared and their surface interactions with 1,2,3,4-dibenzanthracene and 1,2,5,6-dibenzanthracene studied. There was some interaction between 1,2,3,4-dibenzanthracene and the mixed lipid film, with the interaction being greatest at the highest ratio of hydrocarbon to lipid (5:1). Over the range from a 1:10 to 3:1 molar ratio of hydrocarbon:lipid, the extent of interaction was the same. The interaction between the mixed lipid film and 1,2,5,6-dibenzanthracene was greater, with the extent of interaction at high surface pressures lying between that for the control isotherm (lecithin-cholesterol) and those for the other concentrations; at lower surface pressures, the film showing the greatest interaction is the 1:1 ratio film. When the interaction between the two hydrocarbons and lecithin alone was studied, there was a condensing effect on saline, as compared to water. There were no differences between the various concentrations of hydrocarbon:lecithin employed, and there was only a slight difference between the interactions of the two compounds with lecithin. The data support the notion that lecithin has the ability to bind small amounts of hydrocarbon strongly. With lecithin monolayers, both dibenzanthracenes showed a strong association, desorption not occurring even at high surface pressures. The strong binding of lecithin may be a protective mechanism of cell membranes, preventing the entrance of material into the cell.

- 5449 GENETIC DIFFERENCES IN ARYL HYDROCARBON HYDROXYLASE INDUCTION AND BENZO(a)PYRENE-PRODUCED TUMORIGENESIS IN THE MOUSE. (E.) Benedict, W. F. (Natl. Inst. Child Health and Human Development, Bethesda, Md.), N. Considine and D. W. Nebert. *Mol Pharmacol* 6(2):266-277, 1973.

Aryl hydrocarbon (benzo[a]pyrene) hydroxylase induction in C57BL/6N and DBA/2N inbred mice and their progeny by aromatic hydrocarbons is most likely controlled by a single autosomal dominant trait in skin, peritoneal lining, and lung, as has been previously illustrated for induction of the enzyme in liver, kidney, and bowel: additional factors may influence the expression in skin, peritoneal lining, and lung, however. The susceptibility to tumorigenesis produced by the topical application of benzo[a]pyrene and promotion by phorbol ester or by the intraperitoneal administration of large doses of

benzo[a]pyrene is not correlated with the genetically mediated presence or absence of the hydroxylase induction in littermates of back-crosses and intercrosses among the C57BL/6N, DBA/2N, and NZW/BLN strains. Therefore, if this enzyme is necessary for metabolic activation of benzo[a]pyrene to the proximal carcinogen, the basal levels of the hydroxylase are sufficient. Compared with application of 7,12-dimethylbenz[a]anthracene directly to the skin, the intraperitoneal administration of the carcinogen is at least 25 times more effective in causing tumors at the site of promotion. This phenomenon may reflect either circulation of carcinogens metabolically activated by liver enzyme systems or circulation of existing viruses, perhaps subviral particles, activated by the parent polycyclic hydrocarbon molecule or its metabolism.

- 5450 THE HISTOLOGICAL APPEARANCE OF TUMOURS DERIVED FROM RAT EMBRYO CELLS TRANSFORMED *IN VITRO* SPONTANEOUSLY AND AFTER TREATMENT WITH NITROSOMETHYLUREA. (E.) Kirkland, D. J. (Dept. Environmental Carcinogenesis, Imperial Cancer Res. Fund, London, England) and C. R. Pick. *Br J Cancer* 28(5):440-452, 1973.

Wistar rat embryo cells were treated *in vitro* with either 25 µg/ml of nitrosomethylurea (NMU) or phosphate buffered saline. Both groups showed morphological transformation by the 13th passage but they showed no ability to grow in soft agar until at least passage 23; the plating efficiencies indicated that the NMU had reduced transformation. However, both the control and treated cells gave rise to fibrosarcomas after similar latent periods following inoculation into syngeneic recipients. The fibrosarcomas had "mykoid" and "leiomyomatous" areas, and resembled hemangiopericytomas; for the most part, the tumors were transplantable. The inoculation of cloned NMU-treated cells into Wistar rats produced fibrosarcomas with a high proportion of giant cells, but only after a very long latent period. No virus particles were detected in tumor samples by electron microscopy.

- 5451 MODEL REACTIONS FOR THE STUDY OF THE INTERACTION OF SULFUR DIOXIDE WITH MAMMALIAN ORGANISMS. (E.) Shih, N. T. (Dept. Chem., U. Wisconsin, Milwaukee) and D. H. Petering. *Biochem Biophys Res Commun* 55(4):1319-1325, 1973.

Formation constants were determined for the reversible reactions of sodium bisulfite with vitamin K3 (menadione) and nicotinamide adenine dinucleotide (NAD). Under moderate conditions of 25 C and pH 7.4, menadione forms a 1:1 adduct with sulfite and aqueous solution. The formation constant for this reaction is $3.1 \times 10^{14} \text{ M}^{-2}$. The pH dependent equilibrium constant is sufficiently small so that significant dissociation of menadione sulfonate occurs when it is placed in solution at pH 7. The formation constant for the reaction of sodium bisulfite with NAD is 36 M^{-1} . Cysteine-S-sulfonate does not react with thiamine pyrophosphate or cytidine under varying conditions of concentration, pH, and temperature. This negative result places a

tentative limitation on the site of postulated mutagenicity or carcinogenicity in mammalian organisms subjected to SO₂, namely the lung. Sulfur dioxide is hydrated at the surface of the lung and once in the blood stream is converted quantitatively to S-sulfo species. To postulate that bisulfate can act at a remote site with respect to the lung requires the demonstration that it is regenerated at that site, for S-sulfonates do not seem to be correspondingly reactive.

- 5452 DIETARY ENHANCEMENT OF INTESTINAL CARCINOGENESIS BY DIMETHYLHYDRAZINE IN RATS.

(E.) Rogers, A. E. (Dept. Nutrition and Food Sci., Massachusetts Inst. Tech., Cambridge) and P. M. Newberne. *Nature* 246(5434/5):491-492, 1973.

Male Sprague-Dawley rats were fed a semisynthetic diet which was either adequate in all known respects (diet 1) or high in fat and marginally deficient in the lipotropes, choline, and methionine (diet 2). After 3 weeks, half the rats on each diet were given ten doses of 30 mg/kg/week of dimethylhydrazine (DMH) intragastrically over 14 weeks, while the rest were given 5 similar doses over 7 weeks. All animals became moribund or died from intestinal carcinoma, with both diet and dose of DMH influencing the length of time between the first dose of DMH and death from intestinal carcinoma. Diet 2 rats given the larger amount of DMH began to die with tumor 17 weeks after initiation of treatment, and the curve rose steeply with time; diet 2 rats given the smaller amount of DMH began to die with tumor after 18 weeks, but the curve rose less steeply. Diet 1 rats given the larger amount of DMH began to die with tumor after 21 weeks, and the curve rose steeply with time; diet 1 rats given the smaller amount of DMH began to die after 23 weeks, and the curve rose less steeply. The rats fed the normal diet were also more susceptible to tumors of the ear duct, with those given the larger amount of DMH showing a higher incidence. Thus lipotrope deficiency enhanced the DMH induction of colonic carcinoma, while offering some protection against the DMH induction of ear duct carcinoma; no significant effect of diet on carcinogenesis in the small intestine was noted. The data suggest that the dietary effect is exerted in the colon itself, either directly on the mucosa or indirectly by altering bacterial flora and its metabolism of the carcinogen.

- 5453 DIETARY HYPOTHESES AND DIET-RELATED RESEARCH IN THE ETIOLOGY OF COLON CANCER. (E.)

Berg, J. W. (Epidemiol. Path. Unit, Natl. Cancer Inst., NIH, Bethesda, Md.), M. A. Howell and S. J. Silverman. *Health Serv Rep* 88(10):915-924, 1973.

Many areas are under investigation in an attempt to link diet to colon cancer etiology. Following migration to another country, the risk of developing cancer of the large bowel shifts toward the level of occurrence in the population already living in that country, thus suggesting that environmental factors are important in the etiology of this disease. Diet is considered an important one of these environ-

mental factors and, in particular, fat, animal protein, and refined carbohydrates have been studied. Intestinal bacteria can form carcinogens from dietary compounds or from digestive secretions and thus the composition of intestinal bacterial flora and the types and amounts of compounds which come into contact with them are being investigated. For the most part, studies endeavoring to demonstrate dietary differences between bowel cancer patients and persons free of the disease have failed to do so. Efforts are being made to study correlations between colon cancer mortality and mortality from other diseases such as coronary heart disease. Nitrosamines, highly suspect among potential carcinogens, are undergoing study. The metabolic regulatory error leading to the abnormal differentiation of colonic epithelial cells is being sought. Frequency studies are under way of premalignant lesions of the large intestine which are epidemiologically related to bowel cancer and may thereby serve to identify persons at high risk.

- 5454 SOME ANALYTICAL AND PRACTICAL INFORMATION ON THE CONTAMINATION OF SMOKED FOOD PRODUCTS BY CARCINOGENS: ANALYTICAL RESULTS. (Fr.) Luks, D. (Food Technol. Service, I.I.F.-I.M.C., C.E.R.I.A., Brussels, Belgium) and J. Lenges. *Rev Ferment Ind Aliment* 28(3):111-114, 1973.

A spectrophotometric method, developed by Toth, was used to determine the benzo(a)pyrene (BP) content of meat and fish smoked by different methods. Although the BP contents of smoked meats were all low (0.0 to 0.9 ppb), that of smoked mackerel was 7.05 ppb. It is suggested that more comprehensive studies of the BP content of smoked fish and foods exposed to municipal air pollution be undertaken to obtain a more complete idea of the toxicity of BP in all Belgian food products.

- 5455 PREVENTION OF THE PRENATAL CARCINOGENICITY OF ETHYLUREA AND NITRITE BY ASCORBIC ACID. (Ger.) Ivankovic, S. (German Ctr. Cancer Res., Heidelberg, Germany), W. J. Zeller, D. Schmähl and R. Preussmann. *Naturwissenschaften* 60:525, 1973.

On the 22nd day of gestation, 20 Wistar rats received: (1) two doses at a 12-hr interval of 150 mg/kg ethylurea, 100 mg/kg sodium nitrite, and 200 mg/kg ascorbic acid p.o., one after another, in that order (6 rats); (2) 30 mg/kg ethylnitrosourea followed immediately by 200 mg/kg ascorbic acid p.o. (5 rats); (3) 30 mg/kg ethylnitrosourea p.o. (5 rats); and (4) 150 mg/kg ethylurea followed immediately by 100 mg/kg sodium nitrite p.o. (4 rats). No malignant tumors had developed in any of the 38 offspring of rats in group (1) by 295 days after treatment, while tumors of the brain, cerebral nerves, bone marrow, and/or peripheral nerves caused deaths of 28 of the 33 offspring from group (2) mothers, 20 of the 31 offspring from group (3), and 32 of the 45 offspring in group (4). These findings demonstrate that ascorbic acid can prevent the synthesis of ethylnitrosourea from ethylurea and sodium nitrite. In this way, ascorbic acid can inhibit tumors induced *in utero* by ethylurea and sodium

nitrite, providing that it is administered before ethylnitrosourea is formed.

- 5456 METABOLISM OF NITROSAMINES *IN VIVO*. III. ON THE METHYLATION OF NUCLEIC ACIDS BY ALIPHATIC DI-N-ALKYL-NITROSAMINES *IN VIVO* RESULTING FROM β -OXIDATION: THE FORMATION OF 7-METHYLGUANINE AFTER APPLICATION OF 2-OXO-PROPYL-PROPYL-NITROSAMINE AND METHYL-PROPYL-NITROSAMINE. (E.) Krüger, F. W. (Toxicology, Chemotherapy Inst., Heidelberg, Germany) and B. Bertram. *Z Krebsforsch* 80(3):189-196, 1973.

Adult male Sprague-Dawley rats were injected i.p. with undiluted ^3H -2-oxo-propyl-propyl-nitrosamine (^3H -2-OPPN) or ^3H -methyl-propyl-nitrosamine (^3H -MPN) and their livers removed after 16 hr. Both compounds, which have been hypothesized to be two last intermediates in the conversion of di-n-propylnitrosamine to methylating agents *in vivo*, produced the same reaction product (7-methylguanine) as did the initial compound. In addition, 2-OPPN readily hydrolysed in alkali under conventional chemical conditions to MPN; thus, it behaved like β -dicarbonyl compounds, which are intermediates in the metabolism of fatty acids.

- 5457 MORPHOLOGICAL TRANSFORMATION IN HAMSTER EMBRYONIC CELL CULTURES AFTER TREATMENT WITH CHEMICAL CARCINOGENS. (Fr.) Markovits, P. (Curie Inst. Fdn. Radium, Paris, France), J. Coppey, A. Mazabraud and M. Hubert-Habart. *C R Acad Sci (Paris)* [D] 277:1265-1268, 1973.

Cultures of embryonic hamster cells in Eagle's medium containing 2 mM glutamine and 10% bovine embryonic serum were incubated with 5 $\mu\text{g}/\text{ml}$ of 7-methylbenzo-(a)anthracene, 0.2 $\mu\text{g}/\text{ml}$ of benzo(e)pyrene, 0.1 $\mu\text{g}/\text{ml}$ of benzo(a)pyrene or 1-2 $\mu\text{g}/\text{ml}$ of 7,10-dimethylbenzo(c)acridine in acetone solutions; the final concentration of acetone in the medium was 5% or less. Medium was replaced after 24-48 hr and once a wk thereafter. Large, thick colonies, consisting of rapidly proliferating cells were found after 4 wk in cultures treated with benzo(a)pyrene, 7-methylbenzo(a)anthracene and 7,10-dimethylbenzo(c)acridine, but not in cultures treated with other compounds or in untreated controls. Subcultures made from transformed colonies of embryonic hamster cells treated with 7-methylbenzo(a)anthracene and from untreated cultures retained their morphological characteristics when passaged. This method is recommended for the screening of potentially carcinogenic hydrocarbons. Its advantages are that it does not employ "feeder" cells or any other treatment (x-irradiation, infection with murine leukemia virus) which would promote cell transformation.

- 5458 INHIBITION OF CARCINOGEN FORMATION IN SKIN IRRADIATED WITH ULTRAVIOLET LIGHT. (E.) Lo, W.-B. (Baylor Coll. Med., Houston, Tex.) and H. S. Black. *Nature* 246(5434/5):489-491, 1973.

Smith-Meyers hairless mice were fed normal diets or

diets supplemented with the following antioxidants (which are known to inhibit lipid peroxidation): ascorbic acid, D,L- α -tocopherol, glutathione, and butylated hydroxytoluene. Skin obtained from animals killed at 2-week intervals was incubated with 3H-(1,2)-cholesterol and irradiated, after which the total water soluble antioxidant content of each sample was determined. During the first 2 weeks, the antioxidant content of the skins from the animals receiving the supplemental diet was 54% greater than that of the control skins; the level decreased thereafter and was maintained at approximately 18% above the control level. The supplemental diet produced no gross morphological abnormalities in the skins or any noticeable side effects in the animals. Approximately 50% protection against the formation of cholesterol α -oxide was afforded the animals fed the supplemental diet for 4, 6, and 10 weeks. These data suggest a possible prophylactic effect of systemic antioxidants on the formation of this carcinogen and the subsequent pathological conditions which may result from its formation.

- 5459 SYNTHESIS OF NUCLEAR AND MITOCHONDRIAL DNA IN RAT LIVER AFTER INJECTION OF THE CARCINOGENIC COMPOUND DIETHYLNITROSAMINE. (E.) Gol-Winkler, R. (Lab. Radiobiol., U. Liege, Belgium) and R. Goutier. *Experientia* 29(10):1282-1283, 1973.

Fasted Wistar rats were injected i.p. with 100 mg/kg of diethylnitrosamine (DENA) or saline and 3 H-thymidine, after which nuclear DNA (nDNA) and mitochondrial DNA (mtDNA) were extracted from their excised livers. Following DENA treatment, nDNA synthesis first passed through an inhibitory phase; after 24 hr, however, it increased to surpass control levels and continued to increase up to 48 hr posttreatment. In contrast, mtDNA synthesis showed a small and transient increase after DENA injection; this was followed by a pronounced decrease at the time when nDNA synthesis began to increase. Thus, the regenerative processes induced by the discrete necrotic lesions caused by DENA treatment differ with regard to the synthesis of nuclear and mitochondrial DNA.

- 5460 ELECTROCHEMICAL PROPERTIES OF POLYCYCLIC COMPOUNDS STUDIED BY THE POLAROGRAPHIC METHOD IN ANHYDROUS SYSTEMS. I. COMPARISON OF HALF-WAVE POTENTIALS OF CARCINOGENIC AND NONCARCINOGENIC HYDROCARBONS IN DIMETHYLFORMAMIDE AND DIMETHYLSULPHOXIDE. (E.) Podany, V. (Cancer Res. Inst., Slovak Acad. Sci., Bratislava) and A. Vachalkova. *Neoplasma* 20(6):631-641, 1973.

To study the polarographic behavior of a series of polycyclic aromatic hydrocarbons, the half-wave potentials of carcinogenic and noncarcinogenic forms of these compounds were measured in dimethylformamide and dimethylsulphoxide, with tetrabutylammonium perchlorate as the supporting electrolyte. The carcinogenic polycyclic hydrocarbons had more positive half-wave potentials than their inactive isomers; this may make their eventual classification possible.

In addition, a logarithmic analysis was made of the first reducing polarographic curves and the reversibility of these waves was followed by the method of switched curves with the aid of Kalousky's switch. The results indicated that in the hydrocarbons studied there is question of a one-electronic reversible polarographic wave. The polarographic method as applied here proved suitable for the qualitative and quantitative determination of carcinogenic hydrocarbons in the atmosphere; it may eventually be applied to the determination of these hydrocarbons in other media in which they occur.

- 5461 GROWTH CHARACTERISTICS OF CHEMICALLY INDUCED RAT MAMMARY TUMORS IN AUTOCHTHONOUS AND SECONDARY HOSTS. (E.) Takizawa, S. (Res. Inst. Nuclear Med. Biol., Hiroshima U., Japan), A. Ito, Y. Kawamura, M. Nakano and A. Kawase. *Gann* 64(5):465-474, 1973.

Rat mammary tumors induced with two carcinogens, N-nitrosobutylurea (NBU) and 7,12-dimethylbenz[a]-anthracene (DMBA), were comparatively studied from the viewpoint of hormone responsiveness. The ovariectomy of autochthonous rats resulted in a marked reduction in tumor size within 3 wk: Most of DMBA-induced mammary tumor disappeared completely thereafter, while half of NBU-induced mammary tumor survived and kept growing. The restoration of mammary tumor growth in the ovariectomized rats was achieved by grafting the intact ovary in accord with the two-fold increase in the serum mamotropin level revealed by radioimmunoassay. All of the NBU-induced mammary tumors (eight cases) became palpable as early as 3 wk after tumor transplantation in syngeneic female rats. On the other hand, 4 of 10 cases of DMBA-induced mammary tumors did not take and the growth rate of the rest was much slower than that of the NBU-induced mammary tumors. Ovariectomized, intact, and castrated Wistar/Furth rats accepted the NBU-induced mammary tumor grafts but not the DMBA-induced mammary tumors. Only in exceptional cases did a successful take of a DMBA-induced mammary tumor in a male co-grafted with a mammotropic pituitary tumor occur. An attempt to correlate the growth characteristics of the mammary tumor and the histological appearance gave inconclusive results.

- 5462 BINDING OF ESTROGENS TO SERUM PROTEIN OF RATS TREATED WITH HEPATOCARCINOGENIC COMPOUNDS. (E.) Nunez, E. (Laboratoire de Biochimie, U.E.R. Biomedicale des Saint-Peres, Paris, France), C. Benassayag, F. Engelmann, G. Vallette, L. Hurst and M. F. Jayle. *Biomedicine* 18(6):514-520, 1973.

The binding of a series of steroid hormones by the serum of ascitic fluid of Wistar rats treated with hepatocarcinogenic compounds (paradimethylaminoazobenzene or 2-acetamidofluorene) was studied. The sera of animals with histologically identified hepatomas producing α 1-fetoprotein displayed a significantly greater affinity for estradiol and estrone than the sera of the other animals. There are three distinct binding sites for estradiol in the sera of the ascitic fluid of some hepatoma

bearing rats: the first is present in low concentration but displays a very high affinity; the second is more concentrated and has a lower affinity; and the third shows a very low affinity probably corresponding to the albumin. Using autoradio-immuno-electrophoresis, the estradiol binding proteins were shown to be a lipoprotein esterase, while the second is located near the albumin and the third corresponds to α 1-fetoprotein.

5463 SYNERGISTIC ACTION OF N-NITROSOBUTYLUREA AND AZATHIOPRINE IN INDUCTION OF LEUKEMIA IN C57BL MICE. (E.) Imamura, N. (Res. Inst. Nuclear Med. Biol., Hiroshima U., Japan), M. Nakano, A. Kawase, Y. Kawamura and K. Yokoro. *Gann* 64(5):493-498, 1973.

C57BL mice were divided into five experimental groups: group A were given 5 daily oral doses of N-nitrosobutylurea (NBU), followed by weekly injections of Imuran for 7 months; group B was given 5 daily oral doses of NBU; group C was given weekly injections of Imuran for 7 months; group D was given weekly injections of antithymocyte serum for 7 months; and group E was untreated. Fifty-eight percent of the group A animals developed thymic lymphomas or reticulum cell neoplasms with a mean latent period of 189 days. None of the group B or group E animals developed leukemia. Twenty-nine percent of the group C mice developed thymic lymphomas, reticulum cell neoplasms or nonthymic lymphomas with a latent period of 182 to 377 days, while about 15% of the group D mice developed thymic lymphomas or reticulum cell neoplasms with a latent period of 221 or 263 days. The incidence of leukemia was significantly higher in the group A animals than in any of the other groups. The thymic lymphomas possessed the Gross-specific cell-surface antigen in cytotoxicity tests. The cell-free transmission of these thymic lymphomas in W/Fu rats failed to confirm the implication of a viral agent. It is concluded that in low-leukemia strains of mice, a dual immunosuppressive conditioning is necessary for the induction of thymic lymphoma and the expression of the G antigen or isolation of Gross virus *per se*.

5464 CO-CARCINOGENESIS WITH RESPECT TO THE CONTENTS OF CIGARETTE TOBACCO. (E.) Davies, J. C. (Guy's Hosp., London, England). *R Soc Health J* 93(6):296-301, 1973.

The concept of co-carcinogenesis holds that mutagenesis involves an initiating factor, which alters the environment of the cell enabling it to enter into the neoplastic state, and a promoting factor, which takes over after the cell has been transformed. While the initiating agent must be a true if not complete carcinogen, the promoter need not be a carcinogen itself as long as it promotes neoplastic change. The polynuclear aromatic hydrocarbons in cigarette smoke can be classified as initiators, for they are carcinogenic but not complete carcinogens. Further, tobacco tar has been shown to be a potent promoting agent which will promote tumor initiated by minute amounts of carcinogen; the acid

and phenolic fractions contain the most effective promotion agents. Little evidence exists concerning the mechanism by which tobacco tar promotes tumor development, although some of its promotional activity seems to occur via the removal of protective -SH groups from cells by acetaldehyde (present in cigarette smoke). In addition, other promoting agents (viruses, heat, radiation, chemical irritants, and nutritional deficiency) seem to be involved in tobacco carcinogenesis. Thus, carcinogenesis by cigarette tobacco does not appear to involve the action of one or more complete carcinogens, but rather involves a process of tumor initiation by an incomplete carcinogen followed by promotion of these neoplastic changes by various other agents.

5465 *IN VITRO* TRANSFORMATION OF NEWBORN HAM-STER CELLS BY SODIUM NITRITE. (E.) Tsuda, H. (Cancer Inst., Tokyo, Japan), N. Inui and S. Takayama. *Biochem Biophys Res Commun* 55(4):1117-1124, 1973.

Cell cultures from newborn Syrian hamsters were exposed for 24 hr to a culture medium containing 0.05 or 0.1 M sodium nitrite; they were then washed and maintained in normal culture medium. No detectable cytotoxic changes were seen in cultures treated with 0.05 M NaNO_2 , but 2/3 of the cells treated with 0.1 M NaNO_2 appeared necrotic and shrunken after treatment. One week after treatment, distinct morphological changes were seen which disappeared after subculture. Twenty-one to 127 days after treatment, the cells showed accelerated growth and fusiform shape and grew to form a dense criss-crossed layer; these features did not disappear after subculture. Similarly transformed cells appeared 10 wk later in the surviving control cultures. In the early stages of transformation, the chromosome number in the NaNO_2 -treated cells varied from near diploid to tetraploid; in later stages the number remained constant around the diploid region. The transformed cells were inoculated into the cheek pouches of young adult hamsters, where the cells from two NaNO_2 -treated cultures produced tumors which reached massive size within 100 days. These tumors were diagnosed as fibrosarcomas. Metastases of the liver, lungs, lymph nodes, and kidneys resulted in one animal injected with NaNO_2 -transformed cells.

5466 A CHEMICAL ADDUCT OF TRYPTOPHAN AND THE ONCOGEN 3-ACETOXYXANTHINE. (E.) Stöhler, G. (Memorial Sloan-Kettering Cancer Inst., New York, N.Y.), G. Salemnick and G. B. Brown. *Biochemistry* 12(25):5084-5086, 1973.

Two products of the reaction of L-tryptophan with the activated oncogen 3-acetoxanthine at neutral pH have been characterized as a pair of diastereoisomers with the structures of [3-(2-amino-2-carboxyethyl)-3-(8-xanthinyl)]indolenines (structure III). The two isomers can be isolated together in 25% yield. Simultaneously, a portion of the tryptophan is oxidized to unidentified colored products and about 30% of the tryptophan is recovered unchanged. A metabolic experiment with [8- ^{14}C]-3-hydroxyxan-

thine injected i.p. into a Sprague-Dawley rat indicates that 0.25% of the total urinary radioactivity accompanies one of the isomers of III in three sequential chromatographic systems.

- 5467 SPECIFIC ESTROGEN RECEPTOR OF THE DMBA-INDUCED MAMMARY CARCINOMA OF THE RAT AND ITS ESTROGEN-REQUIRING MOLECULAR TRANSFORMATION. (E.) Leclercq, G. (Tumor Ctr., Free U. Brussels, Belgium) and J. C. Heuson. *Eur J Cancer* 9(9):675-680, 1973.

Cytosol preparations of 11 7,11-dimethylbenz(a)anthracene (DMBA)-induced mammary carcinomas from Sprague-Dawley rats were tested for their binding affinity for ^3H -estradiol-17 β at 18 C. Specific estrogen receptors with a high binding affinity for estradiol were found; incubation with estradiol yielded 3.5S and occasionally 7.5S receptors in low-ionic sucrose gradients. In contrast, a 7.5S receptor was found when nonincubated cytosol samples were fractionated by ultracentrifugation and labeled with estradiol. Conversion of the 7.5S receptor to the 3.5S receptor on incubation was obtained only in the presence of estradiol, suggesting that the hormone is required either to effect the molecular conversion or to stabilize the converted form if this is due to limited proteolysis.

- 5468 EFFECTS OF CHRONIC NICOTINE ADMINISTRATION AND AGE IN MALE FISCHER-344 RATS. (E.) Thompson, J. H. (U. California Sch. Med., Los Angeles), F. D. Irwin, S. Kanematsu, K. Seraydarian and M. Suh. *Toxicol Appl Pharmacol* 26(4):606-620, 1973.

The chronic effects of nicotine were studied in male Fischer-344 rats over periods of 2 or 22 months. Nicotine (1000 μg base/ml/kg/day) was given s.c. in 6% gelatin; control rats received 0.85 g/100 ml w/v NaCl in 6% gelatin. The nicotine-treated rats achieved and maintained a significantly lower ($p < 0.01$) weight gain than control animals, and the weight of several tissues in both control and nicotine-treated groups showed a change with age. There was no significant change in hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, hemoglobin concentration, or red and white blood cell counts between control and nicotine-treated rats. Similarly, the differential white cell count did not differ between the 2 groups; however, the percentage of neutrophil polymorphonuclear leucocytes increased and the percentage of lymphocytes decreased in both groups with age. Platelet number and morphology were not altered. Several neoplasms developed in the animals injected for 22 months. Two tumors, an adenocarcinoma of the lung and chromophobe adenoma, developed in the 6 aged control rats (33%), and 9 tumors (3 instances of pheochromocytoma, 4 cases of epidermoid carcinoma of the skin, 1 case of leukemia, and 1 case of fibrosarcoma) developed in 8 of the aged treated rats (29%). The incidence of Leydig cell hyperplasia differed significantly, with lesions developing in 66% of the old control rats as compared to 89% of the old treated rats ($p < 0.05$). It

is possible that the physiologic age of the nicotine-treated rats was significantly greater than the controls, and thus the animals were at greater risk for the development of this lesion. Nicotine administration had no effect on the Ca^{2+} -dependent myosin ATPase activity or on the lactic dehydrogenase activity and isozyme pattern from predominantly fast (gastrocnemius), slow (soleus) or cardiac muscles. Mg^{2+} -dependent ATPase activity from soleus muscle myofibrils was considerably depressed after 22 months of nicotine treatment, whereas activity from cardiac and gastrocnemius muscles was unchanged.

- 5469 EFFECT OF SOME DERIVATIVES OF NAPHTHALENE ON ARYL HYDROCARBON (BENZO(A)PYRENE) HYDROXYLASE *IN VITRO*. (E.) Alexandrov, K. (Nat'l. Inst. Scientific Cancer Res., Villejuif, France). *Experientia* 29(10):1209-1210, 1973.

Male Wistar rats were injected i.p. with methylcholanthrene, after which their liver microsomes were assayed for aryl hydrocarbon (benzo(a)pyrene) hydroxylase and the alkali-extractable metabolites of benzo(a)pyrene. The addition of naphthalene or its naphthol-(1), naphthol-(2), naphthonitril-(1), or naphthonitril-(2) derivatives to the benzo(a)pyrene substrate had no significant effect on benzo(a)pyrene hydroxylation when the medium contained either normal or methylcholanthrene-induced microsomes. However, naphthyl-phosphordicloridat-(1), naphthyl-phosphordicloridate-(2), and 2-methyl- β -naphthothiazol inhibited benzo(a)pyrene hydroxylation by 14%, 21%, and 45%, resp., in the control microsomes, and by 22%, 22%, and 55%, resp., in the induced microsomes. The first two compounds probably inhibited benzo(a)pyrene hydroxylation due to the relative instability of the two molecules which, in the water phase, decompose easily, liberating the halogen radicals which probably act directly on the enzyme. The third compound exhibited its inhibitory influence via its occupation of the benzo(a)pyrene hydroxylation enzyme site. These data support the hypothesis that there is no correlation between the absence or presence of carcinogenic activity and the ability to alter benzo(a)pyrene hydroxylation.

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- See also:
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5550 ULTRAVIOLET-INDUCED REPAIR REPLICATION IN AGING DIPLOID HUMAN CELLS (WI-38). (E.)

Painter, R. B. (Lab. Radiobiol., U. California, San Francisco), J. M. Clarkson and B. R. Young. *Radiat Res* 56(3):560-564, 1973.

Human WI-38 cells were examined after UV-irradiation for their ability to perform repair replication as a function of age in culture. Cells at passage 28 were inoculated into petri dishes at 2 different concentrations, one about 8 times the other. The cultures from the heavier inoculum soon became confluent and were left in plateau phase for 2 days. At this time the cultures from the lighter inoculum were still growing vigorously. Both were irradiated with various exposures to UV light, and no differences in the extent of repair replication carried out at any of the UV exposures used were observed. Repair in late passage cells was studied with a dose of 100 ergs/min² and cells in the last passage exhibited a 25-40% deficiency in repair replication. Comparison of passage 41 cells with passage 20 cells showed no difference in ability to carry out repair replication. After 3 more passages for the older and 4 more for the younger culture, the older cells were obviously in the terminal state of culture and showed about 35% less repair replication. Thus, if the deficiency in repair replication observed in senescent cells is really due to a repair defect, it must appear abruptly at the end of their *in vitro* life. If repair deficiency caused *in vitro* senescence, there would be a continuous decrease in repair efficiency as cells aged. Thus, these data do not support the hypothesis that excision repair, or lack thereof, is important in the aging of diploid cells.

5551 PRECONCEPTION RADIATION AND LEUKEMIA. (E.)

Natarajan, N. (Roswell Park Memorial Inst., Buffalo, N.Y.) and I. D. J. Bross. *J Med* 4(5):276-281, 1973.

To determine the effect of maternal exposure to preconception radiation on the relative risk of leukemia in the child, data were prepared from 295 cases of childhood leukemia and 813 control cases; all children were under 15 yr of age. When there was no exposure to preconception radiation, a history of virus diseases (chicken pox, measles) does not increase the relative risk of leukemia; however, a history of virus diseases early in childhood may be an indication of increased susceptibility. A history of bacterial diseases (pneumonia, dysentery, rheumatic fever) in conjunction with preconception radiation significantly increases the relative risk of leukemia. Similarly, except in the case of children aged 10 to 14 yr, there is a definite increase in relative risk when a history of allergic diseases (asthma, hives, eczema) is combined with maternal preconception radiation. The maternal radiation may produce chromosome damage to the ova which is expressed as generalized susceptibility to leukemia and other diseases in the child. The defects in the host defenses of the child would render him vulnerable to leukemia, but exposure to some other hazard would be required to trigger the disease.

5552 MECHANISMS OF CHROMOSOMAL ABERRATION PRODUCTION. I. ABERRATION INDUCTION BY ULTRAVIOLET LIGHT. (E.)

Bender, M. A. (Vanderbilt U. Sch. Med., Nashville, Tenn.), H. G. Griggs and P. L. Walker. *Mutat Res* 20(3):387-402, 1973.

Chromosomal aberration production in V-79 Chinese hamster tissue culture cells by UV light administered during the post-DNA-synthetic G₂ phase of the cell cycle was studied. The treatment produced achromatic lesions and some chromatid deletions in the first post-irradiation mitosis, but no isochromatid deletions or chromatid exchange aberrations. In contrast, when G₂ UV-irradiated cells were examined in their second post-irradiation mitosis, there were significant yields of chromatid-type aberrations of all types, including isochromatid deletions and chromatid exchanges. A model for chromosomal aberration production by UV is presented. According to the model: The vertebrate chromosome is mononeme; the UV-induced DNA lesion leading to the production of most aberrations is the cyclobutane dimer between adjacent pyrimidines in one polynucleotide strand; single chain breaks appear at metaphase as achromatic lesions; dimer removal sometimes leaves unrepaired single chain gaps, possibly as a result of incomplete excision repair; the single-stranded DNA opposite a single chain gap can be cleaved by a single-strand DNAase; gaps are left in newly synthesized DNA polynucleotide chains opposite defective template chains; and double-strand breaks present following local DNA replication may "spread" to the other chromatid by a recombinational process between template and new polynucleotide chains, one from each of the homologous double helices. The model predicts the occurrence of isoachromatic lesions and of chromatid deletions paired (isolocus) with achromatic lesions. It also accounts for the phenomenon of sister-chromatid exchange as a manifestation of a recombinational, or post-replication, repair mechanism. Finally, the model offers a simple interpretation of chromosomal aberration production by a variety of chemical agents.

5553 RETENTION OF ¹²⁵I GIVEN AS ¹²⁵I-5-iodo-2'-DEOXYURIDINE TO MICE AFTER 180 MeV PROTON OR ⁶⁰Co GAMMA IRRADIATION. (E.)

Johanson, K. J. (Dept. Radiation Biol., Gustaf Werner Inst., Sweden). *Acta Radiol (Ther) (Stockh)* 11(5):465-471, 1972.

The effect of 180 MeV proton and ⁶⁰Co gamma radiation on ¹²⁵I retention 20 hr after ¹²⁵I-5-iodo-2'-deoxyuridine (¹²⁵IUDR) injection was investigated in the whole mouse, the small intestine and the spleen. Female NMRI mice weighing 20 to 25 g were used. Two hr after irradiation the mice were given 0.08 µCi ¹²⁵IUDR/g body wt i.p. in isotonic saline at a specific activity of 100 µCi/µmol. The ¹²⁵I activity of whole mice was determined 20 hr after injection of ¹²⁵IUDR with a 3 inch NaI(Tl) crystal with a 1.5 inch well and 0.1 µCi ¹²⁵I in "mice geometry" as a standard. At low doses (40 rad, for the spleen also 80 rad) the ⁶⁰Co gamma radiation seems to affect the ¹²⁵I retention with higher efficiency than the 180 MeV protons; this effect was observed in the organs examined as well as in

whole mice. The two types of radiation seem similarly to affect the ^{125}I retention in the dose range 80 to 640 rad (160 to 640 for the spleen). The RBE for 180 MeV protons of 1.2 ± 0.3 from previous work seemed to be confirmed.

5554 BETA RAY INDUCED SKIN TUMOR FORMATION IN MICE: TUMOR INDUCTION EFFICIENCY AND EVIDENCE FOR RESTORATION OF LATENT BETA RAY EFFECT. (E.) Hoshino, H. (Natl. Cancer Ctr. Res. Inst., Tokyo, Japan) and H. Tanooka. *J Radiat Res* 14(1):105, 1973.

5555 CHARACTERISTICS OF RADIATION-INDUCED LEUKEMIA IN NIH SWISS MICE. (E.) Takamori, Y. (Radiation Ctr., Osaka, Japan), M. Okumoto and Y. Iwai. *J Radiat Res* 1(1):105, 1973.

5556 WEIGHT OF THE THYMUS AND THE SPLEEN OF MICE CONTINUOUSLY ADMINISTERED WITH ^{90}Sr AND ^{137}Cs . (E.) Nishio, K. (Radiation Ctr., Osaka, Japan). *J Radiat Res* 14(1):108, 1973.

5557 STUDIES ON LATE EFFECTS OF RADIATION IN MICE. III. HAPTOGLOBIN LEVELS IN PLASMA. (E.) Hayakawa, J. (Natl. Inst. Radiol. Sci., Chiba, Japan) and T. Tsuchiya. *J Radiat Res* 14(1):108, 1973.

5558 ANALYSES OF DIFFERENTIAL SENSITIVITIES OF SYNCHRONIZED HELA S 3 CELLS TO RADIATIONS AND CHEMICAL CARCINOGENS DURING THE CELL CYCLE. I. ESTABLISHMENT OF OPTIMUM CONDITIONS FOR OBTAINING A LARGE HIGHLY PURIFIED SYNCHRONIZED POPULATION. (E.) Watanabe, M. (Fac. Pharm. Sci., Kanazawa U., Japan) and M. Horikawa. *J Radiat Res* 14(3):258-270, 1973.

5559 RELATION BETWEEN RADIATION DOSE, FREE RADICAL FORMATION AND THE INDUCTION OF CHROMOSOME ABERRATIONS IN LYMPHOCYTES. (Ger.) Grillmaier, R. E. (Inst. Biophysics, U. Saarland, Homburg, Germany). *Ann Univ Sarav[Med]* 20(1):1-89, 1973.

5560 THOROTRAST INDUCED TRANSITIONAL CELL CARCINOMA IN A RESIDUAL URETER AFTER NEPHRECTOMY. (E.) Mihatsch, M. J. (Dept. Path., U. Basel, Switzerland) and G. Rutishauser. *Cancer* 32(6):1346-1349, 1973.

See also:

- * (Rev): 5410, 5428
- * (Chem): 5458, 5474
- * (Viral): 5586

- 5561 TUMORIGENESIS OF ADENOVIRUS-SV 40 HYBRIDS IN HAMSTERS. (E.) Chino, F. (Dept. Path., Natl. Inst. Health, Musashi-Murayama, Tokyo, Japan). *Acta Pathol Jap* 23(3):479-491, 1973.

Subcutaneous tumors were induced by inoculating adenovirus (Adeno) 7-SV 40 hybrid or Adeno 12-SV 40 hybrid into newborn hamsters. The tumors showed two distinct morphological characteristics; one resembled the tumor induced by Adeno 12 and the other that by SV 40. Regardless of tumor type, the tumor cells contained T antigens derived from both Adeno and SV 40 genomes, as revealed by the fluorescent antibody technique. A portion of the Adeno type tumor cells did not show fluorescent T antigen specific for the SV 40 genome. These tumors may have originated from the cells infected with complete adenovirus, which was included in the hybrid virus population. From the sequential observations of tumor development, it was found that the two tumor types were distinguishable as early as the onset of tumor formation, and that the tumor cell foci of the two types developed simultaneously in separate places and then grew to make contact with each other. The tumor foci of each type induced by either hybrid virus appeared earlier than those induced by the parent viruses. A primary site of the tumors induced by Adeno 12 was the muscle tissue although the primary site of the Adeno type tumors induced by the hybrid viruses was the s.c. connective or adipose tissue. On the other hand, the primary site of SV 40 type tumors induced by the hybrid viruses was in the s.c. connective or adipose tissue; this was also the primary site of the SV 40-induced tumors. The data indicate that the morphology of the tumors induced by the Adeno-SV 40 hybrid may be determined by the differentiation potency of the target cell.

- 5562 EFFECTS OF POLYADENYLIC ACIDS ON FUNCTIONS OF MURINE RNA TUMOR VIRUSES. (E.) Tennant, R. W. (Biol. Div., Oak Ridge Natl. Lab., Tenn.), J. G. Farrelly, J. N. Ihle, B. C. Pal, F. T. Kenney and A. Brown. *J Virol* 12(6):1216-1225, 1973.

Single-stranded polyribonucleotides, which competitively inhibit murine RNA tumor virus reverse transcriptase *in vitro*, were tested as inhibitors of various virus functions in cell culture. The compounds had two concentration-dependent effects. At high concentrations (100 µg/ml), both poly(adenylic acid) [poly(A)] and poly(2'-O-methyladenylic acid) [poly(Am)] inhibited the uptake of radioactively labeled leukemia virus by Swiss mouse embryo cells, but neither had a similar effect on Sindbis virus adsorption. At low concentrations (10 µg/ml), poly(Am) did not inhibit the uptake of leukemia virus but did inhibit virus replication by 85%; in contrast, the replication of Sendai virus and Sindbis virus was not inhibited significantly at this concentration. Both compounds were effective only when added prior to or early during virus infection. Poly(Am) was a much more effective inhibitor than poly(A), probably due to the nucleic acid resistance of the former compound. Poly(Am) at 5 µg/ml also inhibited the transformation of 3T3 cells by Moloney sarcoma virus. However, neither poly(A)

nor poly(Am) at high concentrations inhibited the activation of endogenous leukemia virus by iododeoxyuridine in AKR mouse embryo cells. These results suggest that virus reverse transcriptase plays an essential role in both the replication of exogenous murine leukemia viruses and the transformation of cells by murine sarcoma viruses but probably has no role in the activation of endogenous leukemia virus.

- 5563 STUDIES ON RAT C-TYPE VIRUS "WERC". I. PRESENCE OF GS-INTERSPECIES ANTIGEN AND A NEW COMPLEMENT-FIXING ANTIGEN, SHARED BY AVIAN MYELOBLASTOSIS VIRUS. (E.) Simkovic, D. (Cancer Res. Inst. Slovak Acad. Sci., Bratislava, Czechoslovakia), M. Grofova, M. C. Aupoix, M. C. Berthelon-Martin, M. Simkovicova and J. Stevonkova. *Neoplasma* 20(6):591-596, 1973.

Complement-fixing (CF) antigen(s) was demonstrated in density gradient purified WERC (TE-Werc) virus (produced *in vitro* by spontaneously transformed rat embryo cells of the WERC cell line) tested with absorbed guinea pig antisera. In further CF tests, detectable amounts of gs-interspecies (gs-3) antigen were detected in TE-Werc virus preparations. The Werc virus preparations also contained a new complement-fixing antigen shared by avian myeloblastosis virus. The new CF antigen may represent a type of interclass gs-antigen.

- 5564 SMALL RNAs OF ROUS SARCOMA VIRUS: CHARACTERIZATION BY TWO-DIMENSIONAL POLYACRYLAMIDE GEL ELECTROPHORESIS AND FINGERPRINT ANALYSIS. (E.) Sawyer, R. C. (Dept. Physiological Chem., U. Wisconsin, Madison) and J. E. Dahlberg. *J Virol* 12(6):1226-1237, 1973.

Approximately 15 to 20 different species of small (4 to 7S) RNAs were purified via the two-dimensional polyacrylamide gel electrophoresis of RNA isolated from virions of the Schmidt-Ruppin D strain of Rous sarcoma virus. Each species of small RNA was isolated free of 70S RNA; nine of them, including 5S and 7S RNAs, were also found associated with the 70S genomic RNA. Most of the 4S RNAs are present at an average of less than one copy per virion. The 4S RNAs have T1 RNase (EC 2.7.7.26) fingerprints, which are very similar to those of tRNAs. One of the smallest 4S RNAs, which can act as a primer for initiation of RNA-directed DNA synthesis, is associated with the 70S RNA in 1 to 2 copies per complex, whereas an additional 6 to 8 copies of this molecule are free.

- 5565 DNA REPLICATION IN SV40-INFECTED CELLS. IX. THE INHIBITION OF A GAP-FILLING STEP DURING DISCONTINUOUS SYNTHESIS OF SV40 DNA. (E.) Laipis, P. J. (Dept. Biochem. Sci., Princeton U., N.J.) and A. J. Levine. *Virology* 56(2):580-594, 1973.

Replicating molecules of small-plaque simian virus 40 (SV40) DNA isolated from lytically infected Af-

rican green monkey kidney cells treated with hydroxyurea (HU) were repaired in an *in vitro* DNA synthesizing system using T4 DNA polymerase and *Escherichia coli* polynucleotide ligase. In the presence of HU, most of the residual DNA synthesized was initially in the form of short 4-5S fragments which were synthesized from both template strands of the SV40 DNA molecule; these fragments are a normal intermediate in SV40 DNA replication. The short fragments, hydrogen bonded to the parental SV40 template molecules, are separated from themselves and from progeny molecules by gaps of one or more nucleotides. About 20% of the gaps are not repairable *in vitro*, while the rest can be repaired and the fragments ligated to form longer polynucleotide chains. It is suggested that two DNA polymerases are involved in SV40 DNA replication: one is involved in the synthesis of short 4-5S fragments, and the other is responsible for filling in the gaps left between fragments and allowing ligation to occur. The gap-filling process can be partially inhibited by HU, which lowers the levels of deoxynucleoside triphosphates in the cells.

- 5566 ISOLATION AND PARTIAL CHARACTERIZATION OF THE INTERNAL STRUCTURAL PROTEINS FROM MURINE INTRACISTERNAL A PARTICLES. (E.) Marciani, D. J. (Nat'l. Cancer Inst., Bethesda, Md.) and E. L. Kuff. *Biochemistry* 12(25):5075-5083, 1973.

Intracisternal A-type particles were prepared from MOPC-104E and RPC-20 plasma cell tumors in BALB/c mice and from cultured neuroblastoma cells of A/Jax origin. The structural proteins from the inner shells of the particles were dissociated and separated, and the isolated fractions analyzed. The main polypeptide which was common to all the intracisternal A particles studied had a molecular wt of 73,000 daltons as determined by gel chromatography and electrophoresis. The minor components differed in proportion in the particles from the three different tumors. The main proteins in the RPC-20 and neuroblastoma particles were homogeneous, but the MOPC-104E main component was heterogeneous, as were the lower molecular wt components of the particles from all three sources. Immunodiffusion showed reactions of apparent identity between the inner shell proteins regardless of size and origin, while electrophoretic comparison of the CNBr-cleavage products from the main proteins and the 46,000 molecular wt proteins of MOPC-104E and RPC-20 origin showed that all the proteins shared a significant fraction of the peptides. Chemical analysis failed to detect sialic acid in the particles. Electrophoresis of the inner shell components isolated from neuroblastoma cells that had been labeled with (^{14}C)-amino acids and (^3H)-glucosamine showed that a fraction of the tritium label migrated with the ^{14}C -labeled structural proteins. Most of the tritium label was in glucosamine, with a small fraction in galactosamine. In that the inner shell proteins of the intracisternal A particles resemble some mitochondria membrane proteins and tonofilament proteins, it is possible that A particles in transformed cells may result from the abnormal modification of some cellular struc-

tural components or inappropriate production of a fetal protein. However, these particles may also be viral in nature, as suggested by their morphology.

- 5567 XENOTROPIC VIRUSES: MURINE LEUKEMIA VIRUSES ASSOCIATED WITH NIH SWISS, NZB, AND OTHER MOUSE STRAINS. (E.) Levy, J. A. (Cancer Res. Inst., U. California, San Francisco). *Science* 182(4117):51-53, 1973.

Spleen, thymus, and kidney cells from NIH Swiss, C57/B16J, (NZB X C57/B16J) F1, and (NZB X NZW) F1 mice were cultured and 10,000 normal rat kidney (NRK) Harvey cells (derived from NRK cells transformed by the Harvey strain of murine sarcoma virus) added to the cultures. After cocultivation with NRK Harvey cells, the spleen and kidney cultures from all four mouse strains and the thymus cultures from the NIH Swiss mice produced a pseudotype sarcoma virus of low titer that could transform rat but not mouse cells; this pseudotype virus also transformed guinea pig, cat, rabbit, bovine, and human cells. Since this virus, which is similar to a C-type virus associated with NZB mice, has the general characteristics of murine leukemia virus (MLV) but will only grow in a variety of cells foreign to the host, it is considered a xenotropic (X-tropic) type MLV. The X-tropic virus has been found in the tissues of newborn NIH Swiss mice, but not in the embryos of NIH Swiss or other mice. However, it is present in every cell derived from NZB embryos and may reflect a specific defect in NZB mice that has a relation to their development of autoimmune disease. Tissues from an immunosuppressed NIH Swiss mouse gave the highest titers of X-tropic pseudotype sarcoma virus following cocultivation. It is likely that endogenous X-tropic viruses will be identified in many, if not all, animal species.

- 5568 HUMAN LYMPHOID CELL TRANSFORMATION BY EPSTEIN-BARR VIRUS. (E.) Pope, J. H. (Queensland Inst. Med. Res., Brisbane, Australia), W. Scott and D. J. Moss. *Nature (New Biol)* 246(153):140-141, 1973.

Mononuclear cell populations were prepared from citrated or heparinized human adult peripheral blood, after which these populations were separated into various subpopulations. All populations were then inoculated with the QIMR-WIL strain of Epstein-Barr (EB) virus. The initial cell population was uniformly susceptible to EB virus and a multifocal proliferative response was evident. Cells adherent to culture dishes usually did not transform in response to EB virus. When the cells not adhering to dishes were cultured and inoculated with EB virus, scattered attached foci of proliferating cells were present and the rest of the cells gradually degenerated. Infected cultures of recombined adherent and nonadherent cells showed an enhanced proliferative response which involved many foci and was similar in extent to that of the initial cell population. This suggested that a cooperative

interaction occurred between these two subpopulations. In another experiment, the initial cell population was run through a column of nylon fiber. Even when overlaid on adherent cells prepared in the first experiment, the cells filtered through the column usually did not transform in response to EB virus. It is concluded that a cooperative effect between subpopulations of adherent and nonadherent cells plays a significant role in the transformation of human lymphoid cells by EB virus *in vitro*, and that the nonadherent subpopulation is distinctive in that it cannot readily be substituted by a sub-population containing both thymus-derived and non-thymus-derived cells. The adherent cells appear to be macrophages, and there is evidence that the cells which are sensitive to transformation by EB virus are B lymphocytes.

- 5569 PROTEINS SPECIFIED BY HERPES SIMPLEX VIRUS. XI. IDENTIFICATION AND RELATIVE MOLAR RATES OF SYNTHESIS OF STRUCTURAL AND NONSTRUCTURAL HERPES VIRUS POLYPEPTIDES IN THE INFECTED CELL. (E.) Honess, R. W. (Dept. Microbiol., U. Chicago, Ill.) and B. Roizman. *J Virol* 12(6):1347-1365, 1973.

High-resolution polyacrylamide gel electrophoresis analyses of polypeptides made in human epidermoid carcinoma no. 2 cells infected with herpes simplex virus (HSV) type 1 revealed the synthesis of at least 49 infected cell polypeptides (ICP) ranging in molecular weight from 15,000 to 280,000. Evidence for virus specificity based on increased rates of synthesis postinfection, immunological specificity, and viral control of mobility and rate of synthesis was available for 47 of the ICP; these 47 can account for 75% of the virus genetic information assuming a DNA molecular weight of 10^8 and asymmetric transcription. On the basis of their mobility relative to virion proteins, the ICP were characterized as structural (S, 23 polypeptides), nonstructural (NS, 16 polypeptides), or unassigned (U, 10 polypeptides). Rapid posttranslational cleavages of HSV proteins during ICP synthesis were not detected; rapid posttranslational cleavages were readily demonstrated in poliovirus-infected cells and these were blocked by protease inhibitors. Slow posttranslational changes in the mobility of at least two polypeptides were observed. The pattern and amount of ICP synthesized were regulated. The ICP formed six classes (A-F) differing in their kinetics of synthesis. S and NS ICP were distributed nonrandomly among these classes. Forty-seven percent of the S protein amino acid sequences constituted class A, comprised "late" S proteins, and were characterized by progressively increasing rates of synthesis until at least 12 hr postinfection; "early" S proteins constituting class C and amounting to 31% of the total amino acid sequences were synthesized with initially increasing rates until 4 hr postinfection and with declining rates thereafter. NS polypeptides and the remaining S polypeptides were distributed among the other kinetic classes. Control of protein abundance was evident in that the polypeptides were not made in equimolar amounts. However, S and NS polypeptides could not be differ-

entiated on the basis of their molar rates of synthesis. The bulk of the detected polypeptides did not differ by more than 8-fold in their molar rates of synthesis.

- 5570 EXPRESSION OF MALIGNANCY IN INTERSPECIES CHINESE HAMSTER X MOUSE CELL HYBRIDS.

(E.) Barski, G. (Tissue Culture Virus Lab., Inst. Gustave-Roussy, Villejuif, France), M.-G. Blanchard, J. K. Youn and B. Leon. *J Natl Cancer Inst* 51(3): 781-792, 1973.

Interspecies hybrids of mouse R4/B, bromodeoxyuridine (BUDR)-resistant, malignant cells carrying an overt murine C-type virus infection and Chinese hamster D/AD/Aza, 8-azaguanine-resistant, nonmalignant cells were developed *in vitro* after elimination of the parent cells in medium containing hypoxanthine, aminopterin, and thymidine. The hybrid cells, designated HyCS, were apparently free of C particles. They presented a wide display of karyologic variants showing a majority of mouse telocentric chromosomes and a minority of chromosomes from the Chinese hamster parent. Most of the hybrid population inherited the hamster cell resistance to actinomycin D (AD). The HyCS cells had both mouse and hamster cell-surface antigens and an "intermediary" morphology. HyCS cells inoculated into cheek pouches of Syrian hamsters or into embryonated chick eggs (chorioallantoic membrane or brain) produced tumors from which secondary tumorigenic HyCST lines were developed; this showed a further shift toward higher numbers of predominantly telocentric chromosomes and a return to sensitivity to AD. BALB/c mice syngeneic to the R4/B parent cells rejected the inoculated HyCS cells, then became resistant to challenge with R4/B malignant cells. The nature of the tumor-specific transplantation antigen characteristic of R4/B cells and expressed in the hybrid cells, despite repression of the murine C-type virus infection, is discussed.

- 5571 LEUKEMIA VIRUS-INDUCED IMMUNOSUPPRESSION. IX. DEPRESSION OF DELAYED HYPERSENSITIVITY AND MIF PRODUCTION AFTER INFECTION OF MICE WITH FRIEND LEUKEMIA VIRUS. (E.) Mortensen, R. F. (Dept. Microbiol., Pennsylvania State U., University Park), W. S. Ceglowski and H. Friedman. *J Immunol* 111(6):1810-1819, 1973.

An examination of cell-mediated immunity (CMI) in susceptible adult BALB/c mice infected with Friend leukemia virus (FLV) revealed a marked depression of the delayed hypersensitivity response and its *in vitro* correlate, macrophage migration inhibition. Spleen lymphocytes from mice sensitized with complete Freund's adjuvant (CFA) and infected with low doses of FLV rapidly lost their ability to produce a migration inhibitory factor (MIF) in response to purified protein derivative (PPD). With both direct and indirect assays for MIF it was shown that there was a significant decrease in the production of MIF in response to mycobacterial antigens by 3 days post-infection. The degree of suppression correlated with both the infecting dose of FLV and the time

post-infection. Mice were protected from FLV induced immunosuppression of CMI by vaccination with FLV. *In vitro* spleen lymphocyte stimulation with the thymus derived (T) cell specific mitogen, ConA, and with antigen (PPD) was also rapidly suppressed after FLV infection. Macrophages from leukemic mice were able to respond to MIF-rich culture supernatants, but nonadherent spleen lymphocytes from the same mice were not able to generate MIF. Antagonists or inhibitors of MIF were not detected in the supernatants of leukemic spleen lymphocyte cultures. The development of delayed hypersensitivity to tubercle bacilli could be abrogated by infecting with FLV up to 14 days after injection of CFA. These observations indicate that FLV not only inhibits the bone marrow-derived cell function of antibody formation, but also the cell-mediated immune functions which are mediated by T cells and which have been implicated as the surveillance mechanism responsible for controlling the emergence of neoplasia.

- 5572 TUMOR INDUCTION IN CHINESE STRIPED HAMSTERS (*CRICETULLUS BARABENSIS GRISEUS*) WITH SV40. (Rus.) Kumkumadzhian, V. A. (Armenian Inst. Roentgenol. Oncol., USSR). *Zh Eksp Klin Med* 12(2):9-12, 1972.

SV40 was inoculated s.c. into 46 male and female Chinese striped hamsters (*Cricetullus barabensis griseus*) which were less than one wk old. Of the 32 hamsters which died (69.5%), 17 (53.1%) had tumors at the site of injection. The first tumors were palpated 140 days after inoculation of SV40 and the last, after 210 days. Histological examinations showed that the tumors were undifferentiated sarcomas. These tumors were then homogenized, suspended in physiological saline (1:10), and injected s.c. into other hamsters less than one month old. After an average time of four wk, tumors which were morphologically similar to the ones induced with SV40 developed in these animals.

- 5573 HEMOPOIETIC STEM CELLS IN MICE WITH VIRUS-INDUCED LEUKEMIA. II. STUDIES IN C₃H MICE AFTER RAUSCHER VIRUS INFECTION. (E.) Seidel, H. J. (Ctr. Basic Clinical Res., U. Ulm, Germany). *Z Krebsforsch* 80(3):229-237, 1973.

Following infection of C₃H mice with the Rauscher virus, a disease is seen which is characterized by a slight anemia, thrombocytopenia and neutropenia in the peripheral blood, enlargement of the spleen, and a transient reduction of the bone marrow cellularity combined with a shift to the left in the granulopoietic cell series. After more than 15 days, a regression of the spleen tumor and a regeneration of hematopoiesis is observed. Transplantation assays using (C₃H X C₅₇/B1/6J) F₁ hybrids reveal the existence of a new cell type with tumor cell character (tumor colony forming units, TCFU) as early as 24 hr after virus infection. After 5 days, these TCFU's are also seen in the bone marrow; their turnover rate is high. Spleen colony assays (CFU), performed in parallel, suggest that TCFU's are included in the CFU measurements. The CFU and TCFU numbers per

spleen increase when the organ increases and decrease when the organ regresses to normal cellularity. Higher TCFU numbers are measured when acute anemic or endotoxin treated mice are infected. These findings support the previous view that pluripotent stem cells in cycle are transformed to TCFU's.

- 5574 DNA DEPENDENT RNA POLYMERASE OF KB CELLS. I. ISOLATION OF THE ENZYMES AND TRANSCRIPTION OF VIRAL DNA, MAMMALIAN DNA AND CHROMATIN. (E.) Austin, G. E. (Sch. Med., U. Pennsylvania, Philadelphia), L. J. Bello and J. J. Furth. *Biochim Biophys Acta* 324:488-500, 1973.

Nucleolar (α -amanitin resistant) and nucleoplasmic (α -amanitin sensitive) forms of RNA polymerase were isolated from KB cells, a human tumor cell line, and from adenovirus-infected KB cells, and their transcriptional properties investigated using DNA from KB cells, calf thymus, and adenovirus, and chromatin from calf thymus. The enzymes extracted from the normal and adenovirus-infected cells showed similar chromatographic elution profiles and transcription characteristics. Both the nucleolar and nucleoplasmic enzymes were free of significant amounts of ribonuclease and exonuclease and showed trace endonuclease activity. Calf thymus and KB DNA were transcribed to a similar extent by the KB enzymes, while native adenovirus DNA was poorly transcribed. In addition, the salt and metal cofactor requirements for the transcription of native adenovirus DNA were both different and more stringent than the requirements for the transcription of mammalian DNA; this stringency was lost following denaturation of the adenovirus DNA. The effect of stimulating factor in transcription was also different in that stimulating factor produced a 3-fold stimulation of calf thymus DNA transcription but had little or no effect on the transcription of adenovirus DNA. Both enzymes were capable of transcribing chromatin, although the salt optimum with chromatin was broader and higher than with DNA. The rate of transcription of chromatin by the nucleoplasmic enzyme was 50% of that obtained with DNA; with the nucleolar enzyme, it was 20% of that obtained with DNA. Only small differences were found in the base composition of the RNA synthesized with chromatin and DNA. Inefficient transcription of the viral DNA suggests that a factor required for adenovirus transcription but not necessary for the transcription of mammalian DNA may have been removed during enzyme purification.

- 5575 EPSTEIN-BARR VIRUS (EBV)-INDUCED TRANSFORMATION OF HUMAN LYMPHOID CELLS AND IMMUNOSURVEILLANCE AGAINST LYMPHOMA DEVELOPMENT. (E.) Klein, G. (Dept. Tumor Biol., Karolinska Inst., Stockholm, Sweden). *Ann Immunol (Inst Pasteur)* 124C(3):391-405, 1973.

Immune surveillance against tumors is particularly efficient in relation to potentially neoplastic cells induced by ubiquitous viruses that infect the majority of the species before or during the reproductive age. Therefore, tumors arising in patients whose immune system is depressed, either

by drug treatment or by a congenital deficiency disease, may be particularly interesting for the search after human viruses with an oncogenic potential. Surveillance may be less efficient against tumors with new and more or less unprecedented specificities that have not frequently confronted the immune system during the evolution of the species; this category may include some chemical carcinogens, and perhaps also some viruses that can transform human cells but where man is not the natural host. Obviously, this statement cannot be generalized since the immune system has a vast capacity in reserve to recognize new antigenic specificities. It cannot recognize everything, however, as the examples of genetically determined unresponsiveness clearly show. Attempts at immunological prevention and/or therapy must proceed by quite different pathways against the two types of tumors, that is 1) those resulting from the breakdown of the immune response and 2) those resulting from no or insufficient immune recognition. In the former case, specific or non-specific boosting or perhaps some kind of adoptive effector replacement may be appropriate whereas in the latter case this would not be sufficient. The recent field dealing with the genetics of the immune response, including the conversion of non-responders into responders by different experimental procedures, deserves the greatest attention by cancer immunologists.

- 5576 HUMAN ADENOVIRUS-INDUCED MEDULLOEPITHELIOMATOUS NEOPLASMS IN SPRAGUE-DAWLEY RATS. (E.) Mukai, N. (Dept. Retina Res., Retina Fdn., Boston, Mass.) and S. Kobayashi. *Am J Pathol* 73(3):671-680, 1973.

A direct causal relationship between a human virus and malignant transformations in target cells (sensory neuronal precursors) was suggested by the development of a medulloepitheliomatous neoplasm in the central nervous system of the rat inoculated with adenovirus. Twenty-six newborn Sprague-Dawley rats were given a single intracerebral inoculation with 0.05 ml of adenovirus fluid, $10^{3.5}$ to $10^{4.5}$ TCID₅₀ HeLa cells/0.1 ml, in the left frontal lobe. Within 37 to 151 days after the virus inoculation, 23 (88.7%) rats autochthonously developed an adenovirus-typical neoplasm in the central nervous system. Nine animals developed a multicentric neoplasm closely related to the ventricular system. Nine others developed solid variously sized neoplasms along the ventricular lumen. Some neoplasms showed multiple foci connected with the stratum subependymale ventriculi olfactorii and the velum medullare of the fourth ventricle. Six spinal cord tumors, located chiefly in the dorsal sensory column, developed within 37 to 61 days after intracerebral inoculation. The remarkably uniform histopathologic appearance of all 23 cases was attributed to a medullo-epitheliomatous neoplasm derived from the ependymal anlage. Electron microscopy clearly revealed a solitary cilium within the apical region of many tumor cells. It consisted of a typical ring of nine doublets with no axial pair (a 9 + 0 pattern), the typical structure of cilia of sensory neuronal origin. The appearance of exuber-

ant neuron-like tumor cells with argyrophile cytoplasmic expansions, neurosyncytial mosaic alignment and myelin-like configurations also suggested a neuronal origin. A paucity of mesenchymal stroma in the neoplastic tissue was noted. No control animals developed tumors.

- 5577 NONIMMUNE ROSETTE FORMATION BY LYMPHOMA AND LEUKEMIA CELLS FROM *HERPESVIRUS SAIMIRI*-INFECTED OWL MONKEYS. (E.) Wallen, W. C. (Litton Bionetics, Inc., Kensington, Md.), R. H. Neubauer, H. Rabin and J. L. Cicmanec. *J Natl Cancer Inst* 51(3):967-1975, 1973.

Lymphocytes from *Herpesvirus saimiri* (HVS)-infected owl monkeys (*Aotus trivirgatus*) were obtained from various lymphoid organs and grown *in vitro*. Erythrocytes from 14 species of different animals were examined for their ability to form nonspecific rosettes with HVS-infected and normal lymphocytes. Sheep erythrocytes were the most frequently and consistently bound by both populations, though the HVS-infected lymphoid cells demonstrated a much greater binding frequency than did normal lymphocytes. Although most HVS lymphocytes in culture formed nonspecific rosettes with sheep erythrocytes, the HVS-lymphocyte cultures had few or no complement-reactive cells. Lymphocytes fresh from peripheral blood of one HVS-infected owl monkey also showed an increase in rosette-forming cells and a simultaneous decrease in lymphocytes with complement receptors. A variety of antisera failed to block the nonspecific sheep-erythrocyte rosette formation. Results suggest that in owl monkeys the HVS-infected lymphocytes may represent a subpopulation of cells related to thymus-derived lymphocytes.

- 5578 THE REPLICATION OF POLYOMA DNA. (E.) Crawford, L. V. (Imperial Cancer Res. Fund Labs., Lincoln's Inn Fields, London, England), C. Syrett and A. Wilde. *J Gen Virol* 21(Pt.3): 515-521, 1973.

The DNA replication of a small plaque and large plaque strain of polyoma virus was studied. Following digestion with endonuclease R1, the replicating polyoma virus DNA molecules can be arranged in an orderly series, indicating a unique origin for the bidirectional replication, assuming that the R1 endonuclease cleaves at the corresponding site in each molecule or at a small number of sites very close to each other. The average overall length of all the replicating molecules observed was not significantly different from that of nonreplicating open circular DNA. Thus, no detectable length of DNA was removed by R1 treatment. The symmetry of this array of replicative forms indicates that replication proceeds in both directions from a unique origin at comparable rates. The positions determined for the origin of replication, at 29% of the genome from the R1 site, are similar for the large plaque and small plaque species. The DNA replication of these two strains of polyoma virus appears to be similar in several respects to that of SV40 DNA, although comparison of polyoma virus

DNA with SV40 DNA is difficult since it is not known whether the R1 site is located in a region with equivalent biological function in the two viruses.

- 5579 FUSION OF XC RAT SARCOMA CELLS INDUCED BY MURINE LEUKAEMIA VIRUS-INFECTED MOUSE MAMMARY TUMOUR CELLS. ABSENCE OF INTERFERENCE BY SIMULTANEOUSLY SYNTHESIZED MAMMARY TUMOUR VIRUS. (E.) Svec, J. (Cancer Res. Inst., Bratislava, Czechoslovakia) and J. Links. *Neoplasma* 20(6):699-703, 1973.

C3H mouse mammary tumor primary cultures were co-cultivated with XC indicator cells pretreated with DEAE dextran; multinucleated syncytia characteristic for the action of murine leukemia virus (MuLV) were formed. To determine whether mouse mammary tumor virus (MTV) induces similar cytopathic effects in XC cells, the correlation between plaque formation activity and the presence of MuLV and MTV antigens was examined at various intervals after the seeding of tissue cultures with C3H mouse mammary tumor cells. The plaque-forming activities of type-C-positive and type-C-negative mouse mammary tumor cell lines were also compared. The presence of plaque forming activity in the C3H mouse mammary cultures indicated the presence of MuLV antigens in these cells. Weak positivity in the XC test was also obtained in a few cultures showing no MuLV antigens. The full expression of the MuLV genome continued in 28-day-old cultures of C3H mammary tumor cells, in which the replication of MTV was suppressed. Finally, continuously produced MTV in the CLL-51 mammary tumor cell line, as well as purified and highly concentrated MTV, failed to induce syncytia and plaque formation in the indicator cell line. MTV does not appear to contain the heat-labile envelope lipoprotein which serves as the mediating factor in the MuLV-induced XC cell fusion. In addition, MuLV replicates independently from the expression of the MTV genome in mouse mammary tumors growing *in vitro*.

- 5580 EFFECT OF PHENYLALANINE MUSTARD ON FRIEND VIRUS AND LEUKEMIA INDUCED BY IT. (E.) Platonova, G. N. (Inst. Exp. Clin. Oncology, Acad. Med. Sci. USSR, Moscow), E. S. Revazova and L. F. Larionov. *Bull Exp Biol Med* 75(7):825-827, 1973.

Friend's leukemia virus was incubated with phenylalanine mustard (PM) and injected i.p. into BALB/c mice. In mice treated with virus with PM the incidence of leukemia was 90 to 100%, while in the animals treated with virus incubated in PM, the incidence was 10 to 20%. Varying PM concentrations between the maximal tolerated dose (1 MTD) and 0.25 MTD did not differ their effect on leukemogenesis, although the incidence of leukemia was 100% among animals treated with 0.01 MTD PM. In a second experiment, mice were inoculated with Friend's virus and 24 hr later received the first of 13 to 15 daily i.p. injections of PM (1 mg/kg). The life spans of these mice increased by 49.2 to 135% over those of mice treated with virus but no PM. The increase

in life span was accompanied by a 24 to 65.9% decrease in splenomegaly, with the longer life spans being associated with relatively higher incidence rates of splenomegaly. Thus, PM weakens the leukemogenic effect of Friend's virus, but does not prevent the eventual development of leukemia.

- 5581 AVIAN ONCORNAVIRUS-INDUCED TUMOR ANTIGENS OF EMBRYONIC AND UNKNOWN ORIGIN. (E.) Kurth, R. (Robert Koch Inst., W. Berlin, Germany) and H. Bauer. *Virology* 56(2):496-504, 1973.

A series of immunological methods was used to investigate in detail the cell surface alterations induced by avian oncornaviruses (avian leukosis viruses (ALV) and avian RNA sarcoma viruses (ASV)) in chicken and mouse cells. The malignant transformation of chicken or mouse cells by ATV led to the reexpression of embryonic antigens (EA) on the tumor cell surface. Several qualitatively different EAs were found. EA₁ represents a mouse EA expressed on normal explanted and on ATV-transformed mouse cells; the quantity of EA₁ on normal mouse embryo cells (MEC) as detectable in cytotoxicity tests does not decrease *in vitro* during the first ten passages. EA₂ is an interspecies-specific antigen of normal and transformed mouse and chicken cells; it is not detectable in humoral cytotoxicity tests. EA is an interspecies-specific tumor-associated antigen of embryonic origin; it exists for a limited period of time on embryonic mouse cells around 16 days of gestation, but is no longer detectable on explanted secondary or older MEC derived from mouse embryos at 20 days of age. With the experimental approach used, no identity between the tumor-associated EAs and the previously described tumor-specific surface antigens could be found.

- 5582 HEMATOPOIETIC CFU IN MICE INFECTED BY THE POLYCYTHEMIA-INDUCING FRIEND VIRUS. IV. PATTERN OF BLOOD RECOVERY IN IRRADIATED MICE GRAFTED WITH NORMAL OR INFECTED BONE MARROW CELLS. (E.) Wendling, F. (Radium Inst., Curie Fdn., Orsay, France), P. Tambourin and P. Jullien. *Biomedicine* 18(6):521-529, 1973.

The colony forming unit (CFU) compartment in Friend virus infected mice is composed of hematopoietic CFU which differentiate along a multipotential pattern and allow the survival of isogenic lethally irradiated recipients. The ability of bone marrow CFU from leukemic mice to differentiate into mature progeny was studied during a period of 28 days after cell graft in isogenic X-irradiated recipients, and compared to the progeny supplied by about the same number of normal bone marrow CFU. From these studies, it appears that bone marrow CFU from leukemic animals are actually able to provide reticulocytes, leucocytes and platelets in the peripheral blood. These CFU behave like their normal counterparts when the erythropoietic and granulopoietic functions are considered. The production of peripheral platelets seems to be quantitatively reduced although the time of platelets emergence is not delayed. Thus, bone marrow CFU from leukemic donors appear

quite different from CFU derived from infected spleen. The therapeutic deficiency of spleen-derived CFU is related partly to the alteration of the thrombopoietic recovery. Whether this difference is intrinsic or extrinsic to CFU remains to be clarified.

- 5583 THE PRESENCE AND EXPRESSION OF RNA TUMOR VIRUS GENES IN NORMAL AND INFECTED CELLS: DETECTION BY MOLECULAR HYBRIDIZATION. (E.) Bishop, J. M. (Dept. Microbiol., U. of California, San Francisco), N. Jackson, W. E. Levinson, E. Medeiros, N. Quintrell and H. E. Varmus. *Amer J Clin Pathol* 60 (1):31-43, 1973.

Three molecular probes were used to detect genes of the Rous sarcoma virus and mouse mammary tumor virus in normal and infected cells. Using the 70S RNA of the viral genomes and the single- and double-stranded DNA transcribed from viral RNA by RNA-directed DNA polymerase, it was found that multiple copies of viral genes may be present in the DNA of ostensibly normal cells. However, the infection and transformation of mammalian (mouse and rat) cells by Rous sarcoma virus is accompanied by the appearance of virus-specific nucleotide sequences in the nuclear DNA of the host cells. The expression of Rous sarcoma virus and mouse mammary tumor virus genes in normal and infected cells was measured by RNA-DNA hybridization. Virus-specific RNA is present in both normal and transformed cells which produce neither virus nor detectable viral proteins. These data indicate that the expression of viral genes may not be controlled exclusively by the regulation of transcription.

- 5584 STUDY ON TUMOUR SPECIFIC CELL SURFACE ANTIGEN IN AVIAN SARCOMA VIRUS-INDUCED MAMMALIAN CELLS WITH THE AID OF PEROXIDASE-LABELLED ANTIBODY. (E.) Aupoix, M. C. (Natl. Inst. Hlth. Med. Res., Lyon, France), D. Simkovic and L. Gazzolo. *Neoplasma* 20(6):597-606, 1973.

Horseradish peroxidase was used as a label to detect avian sarcoma virus-induced tumor specific associated antigen (S antigen) on the cell surfaces of tumor cells. Rat tumor (XCtc) and hamster tumor (RSH) cell lines were studied for the presence of S antigen using a rabbit serum prepared against SR-RSV transformed hamster cells RS2/10. No labelling of the cell membranes was observed when either cell type was tested with control normal rabbit serum. With immune rabbit serum a strong, nearly continuous labelling was observed in a close apposition to the cell membranes of both cell types.

- 5585 HERPESVIRUS PARTICLES IN PROSTATIC CARCINOMA CELLS. (E.) Centifanto, Y. M. (Coll. Med., J. Hillis Health Ctr., Gainesville, Fla.), H. E. Kaufman, Z. S. Zam, D. M. Drylie and S. L. Deardourff. *J Viro* 12(6):1608-1611, 1973.

Tumor cells from a cancerous prostate and cells from normal prostate tissue were tested for the

presence of virus by inoculation onto susceptible tissue culture cells, specific immunofluorescence staining with antiserum to herpesvirus, and electron microscopy. Specific immunofluorescence staining was seen in the nuclear and perinuclear areas of some cells and throughout the nucleus and cytoplasm of other cells in the cancerous tissue; nonspecific fluorescence was seen in all cells of the control sample. Electron microscopy revealed the presence of virus particles morphologically resembling intranuclear herpesvirus in the nuclei of the cancer cells. These data indicate a possible relationship between herpesvirus and carcinoma of the prostate.

- 5586 ENHANCEMENT OF TUMOR DEVELOPMENT IN PHYSICALLY-STRESSED MICE INOCULATED WITH AN ONCOGENIC VIRUS. (E.) Seifter, E. (Albert Einstein Coll. Med., New York, N.Y.), G. Rettura, M. Zisblatt, S. M. Levenson, N. Levine, A. Davidson and J. Seifter. *Experientia* 29(11):1379-1382, 1973.

The effect of stress on tumor development was studied in male CBA/J mice placed in partial body casts and inoculated i.m. with murine sarcoma virus Moloney strain (MSV-M). Partial body casting had previously been shown to induce moderate stress manifested by decreased thymus and spleen size and increased adrenal gland size. With all inoculation doses except the highest (1×10^{-1}), stressed mice had a higher incidence of tumor formation than did nonstressed MSV-M inoculated control mice. The latency period for tumor development was dose-related in both groups but was decreased in stressed animals compared to controls. Maximum tumor size was greater and the rate of subsequent tumor regression was slower in stressed mice.

- 5587 STRAND ORIENTATION OF SV40 TRANSCRIPTION IN CELLS INFECTED BY NON-DEFECTIVE ADENOVIRUS 2-SV40 HYBRID VIRUSES. (E.) Khoury, G. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.), A. M. Lewis, Jr., M. N. Oxman and A. S. Levine. *Nature [New Biol]* 246(155):202-205, 1973.

The pattern of SV40 transcription was studied in African green monkey kidney and human embryonic cell cultures lytically infected with one of five non-defective adenovirus 2 (Ad2)-SV40 hybrid viruses. These viruses, which contain a single continuous SV40 DNA segment covalently inserted at one site in the Ad2 DNA molecule, possess both "early" and "late" DNA templates but do not induce late gene products. Experiments in which purified, prelabeled (+) and (-) SV40 DNA strands were hybridized to early and late SV40-specific RNA showed that in each of the Ad2-SV40 hybrids, there was full transcription from the (-) SV40 strand but essentially no transcription from the (+) strands. There was thus no homology between hybrid virus-specific RNA and the (+) strand of SV40 DNA (late template). The finding that hybrid virus-specific RNA, in contrast to either early or early plus late SV40 RNA, hybridized extensively to the (-) strand of an SV40 DNA *H. influenzae* restriction endonuclease fragment (G) which contains only

late DNA sequences strongly indicated that stable "anti-late" RNA sequences were also synthesized in the lytic cycle of the hybrid viruses. These results along with earlier published findings suggest that early RNA transcription in wild-type SV40 infection is initiated on the (-) strand in the region associated with the induction of T antigen and proceeds toward the U antigen region. Late RNA transcription proceeds in the opposite direction on the (+) strand. With the hybrids, transcription of the (-) SV40 strand may be initiated in Ad2 DNA and proceed toward the SV40 early antigen region.

- 5588 NUCLEAR BASIC PROTEINS OF POLYOMA VIRUS-INFECTED CELLS CULTIVATED *IN VITRO*. (E.) Stachurska, M. B. (Inst. Med. Biochem., Med. Acad., Cracow, Poland), M. Guminska and Z. Porwit-Bohr. *Acta Virol* 17(2):97-104, 1973.

Basic proteins (BP) extracted with 0.25 N HCl from cell nuclei of primary cultures of mouse embryo (ME) cells and established cultures of BHK 21 cell lines, were studied in the course of polyoma virus (PV) infection. In infected ME cells, the amounts of both nuclear total proteins (TP) and nuclear BP were diminished. These changes were correlated with an early drop in lysine and an increase in the arginine content. In the BHK 21 cells, a distinct decrease in the basic amino acids lysine and arginine was seen during the late period of secondary cellular transformation after infection. Electrophoresis on polyacrylamide gel revealed a lowered number of several lysine-rich bands in the nuclear BPs of cells cultivated *in vitro*. These data support the hypothesis that the decrease in the nuclear BPs and their fractions, especially the lysine-rich histones, is associated with the dedifferentiation of the cells. The data also indicate that these changes appear in primary ME cells and, to a greater degree, in BHK 21 cells before infection; infection by PV further modifies the composition and amounts of nuclear histones in these cells.

- 5589 CYTOCHALASIN B-INDUCED ACTIVATION IN THE SYNTHESIS OF L-CELL VIRUS PARTICLES. (E.) Sethi, K. K. (Inst. Med. Microbiol., U. Bonn, West Germany), B. Pelster and H. Brandis. *J Gen Virol* 21(Pt. 2):435-440, 1973.

Confluent sheets of L cells from two clones derived from clone NCTN 929 were incubated for 12 hr with cytochalasin B dissolved in dimethyl sulfoxide (DMSO); controls were untreated or incubated with DMSO alone. Electron microscopy revealed that most of the control cells contained a few structures which could be classified as A-type particles. In contrast, the L cells exposed to cytochalasin B contained large numbers of intracytoplasmic and extracellular C-type particles; A-type particles were found only rarely in these cells. Frequently, the C-type particles budded from the plasma membrane and from intracytoplasmic cisternae. The number of virus particles decreased when the treated cells were subcultured without cytochalasin B. These data suggest that in the cytochalasin B treated L cells,

either cytochalasin B fails to stimulate the synthesis of A-type particles or A-type particles undergo rapid differentiation into C-type particles. The information for virus synthesis appears to be present in every L cell.

- 5590 VIRUS PARTICLES IN EARLY MOUSE EMBRYOS. (E.) Biczysko, W. (Wistar Inst. Anat. Biol., Philadelphia, Pa.), M. Pienkowski, D. Solter and H. Koprowski. *J Natl Cancer Inst* 51(3):1041-1050, 1973.

Electron microscope observations of 2- to 4-celled embryos from eight strains of laboratory mice revealed an abundance of intracisternal type-A particles. Most particles were found budding in the membranes of the endoplasmic reticulum. A much smaller number of the same type particle was seen in blastocysts from the same strains. Blastocysts and egg cylinders from highly leukemogenic AKR mice also contained budding and extracellularly located type-C particles. Unfertilized eggs of all strains investigated lacked any visible viral particles.

- 5591 DEOXYGLUCOSE TRANSPORT BY UNINFECTED, MURINE SARCOMA VIRUS-TRANSFORMED, AND MURINE LEUKEMIA VIRUS-INFECTED MOUSE CELLS. (E.) Plagemann, P. G. W. (Max-Planck-Institut Virus Res., Tübingen, Germany). *J Cell Physiol* 82(3):421-434, 1973.

The initial rates of deoxy-D-glucose transport by cultures of growing and density-inhibited mouse embryo cells and lines of mouse cells transformed spontaneously or after infection by murine leukemia virus or murine sarcoma virus were investigated as a function of the deoxyglucose concentration. The apparent K_m for deoxyglucose transport was about the same for all types of cells (1-2 mM). The V_{max} of secondary cultures of mouse embryo cells decreased from 6 nmoles/10⁶ cells/min for sparse cultures to less than 1 nmoles/10⁶ cell/min for density-inhibited cultures. The V_{max} was about the same whether estimated in monolayer culture or in suspensions of cells dispersed by treatment with trypsin. The V_{max} for deoxyglucose transport by the established cells, whether transformed spontaneously or by virus infection, was 4 to 25 times higher than that for density-inhibited mouse embryo cells and was independent of the cell density of the cultures. Deoxyglucose transport was competitively inhibited by Cytochalasin B, Persantin, glucose, and 3-O-methyl-D-glucose, and the apparent K_i values of inhibition were similar for the mouse embryo cells and the various cell lines. Similarly, the sensitivity of the glucose transport systems to inactivation by p-chloromercuribenzoate was about the same for all types of cells. The results suggest that the glucose transport system of the normal mouse embryo cells and the cells of the various established lines is qualitatively the same, but that the number of functional transport sites differs for the various cell lines and decreases markedly in mouse embryo cells with an increase in the cell density of the cultures.

5592 EFFECT OF HISTONE ON ONCOGENIC PROPERTIES OF MOLONEY'S MURINE SARCOMA VIRUS. (E.)

Balandin, I. G. (USSR Acad. Med. Sci., Moscow), Yu. N. Tartarinova, A. M. Amchenkova, V. D. Koltsov, L. L. Krimskaia and A. A. Lushnikov. *Arch Gesamte Virusforsch* 43(1-2):1-6, 1973.

BalB/c mice were inoculated i.m. with a suspension containing an extract of Moloney's murine sarcoma virus (MSV); 2 mg histone was injected 1 hr prior to or simultaneously with the MSV suspension. Histone resulted in a pronounced activation of tumor growth and formation, increasing the sensitivity of the animals to the virus by at least 100-fold. In all cases, histone decreased the latent period of tumor formation and increased the growth rate of the tumors. If the virus dose was reduced to 1:10 or 1:100, the tumors regressed; however, within 25 to 35 days, the development of metastases was observed on the forepaws and cervical lymph nodes, and most of the animals died. No metastases or deaths resulted when the virus dose was reduced to 1:10,000, although considerable reductions in the latent period were observed. Variations in the histone dose were accompanied by corresponding changes in the sizes of the developing tumors; past 2 mg/ml, however, greater doses of histone no longer increased the intensity of tumor growth. The tumors and metastatic nodules which developed in the presence of histone contained active virus; they did not differ in structure from tumors developed without histone. Histone had an inhibiting effect on virus-neutralizing antibody formation. Thus, histone promotes the expression of the oncogenic properties of the virus.

5593 FURTHER STUDIES ON THE DEVELOPMENT OF YABA POXVIRUS IN CELL CULTURE. (E.) Tsuruhara,

T. (Murayama Br., Natl. Inst. Health, Tokyo, Japan) and A. Tsuruhara. *Arch Gesamte Virusforsch* 43(1-2):119-134, 1973.

Yaba poxvirus morphogenesis from penetration to the appearance of the progeny virus was studied in Jinet cells (a cynomolgus monkey kidney cell line). Within 3 hr post infection, the adsorption of virus particles by the cells was observed. The viral surface coat and phagocytic vacuole membrane were then disrupted, and the viral core membrane was finally disrupted. Thus, the DNA-containing viral core substances dispersed in the cytoplasm were recognized as the lower density area, the periphery of which was surrounded by many ribosomal aggregates. The viral uncoating area appeared to correspond to the viral factory to be formed, since the viral protein and DNA synthesis was first detected in such an area at 7 and 9 hr post infection, resp. A typical viral factory 24 hr post infection included the virus particles at various stages of the maturation process, including immature virus particles and virus-related structures such as micelles. The immature virus particle was encircled with a unit membrane which was covered with subunits arranged vertically to the surface. The immature particle was 3000-4000 Å in diameter and the spherical micelle was about 400 Å in diameter, with a unit membrane about 70 Å thick corresponding to the inner membrane of the particle. In addition,

the formation of immature virus particles with micelles was observed in Yaba virus-infected Jinet cells in the presence of hydroxyurea; consequently the Yaba immature virus particles were formed without the synthesis of progeny viral DNA. After the completion of immature virus particle formation, an assembly of new membranous structures appeared inside the virus particle, presumably forming the viral core membrane. The shape of the viral core changed to dumbbell-form making the lateral bodies evident and completing the mature virus.

5594 BIOLOGICAL AND BIOPHYSICAL CHARACTERIZATION OF SV40 CYTOPLASMIC T-ANTIGEN-INDUCING MUTANTS OF PARA-ADENOVIRUS 7. (E.) Guentzel, M. J. (Baylor Coll. Med., Houston, Tex.) and J. S. Butel. *Arch Gesamte Virusforsch* 43(1-2):74-87, 1973.

Mutants of PARA-adenovirus 7 which induce the synthesis of SV40 T antigen in the cytoplasm of cells were characterized biologically and biophysically. The following properties were found to be similar to those of the parental virus which induces nuclear SV40 T antigen: kinetics of replication in monkey kidney cells, intracellular site of particle morphogenesis, relative kinetics of inactivation by ultraviolet light, and buoyant densities of the virions and viral DNA. Transcapsidation of the mutant PARA particles to heterologous adenovirus serotypes resulted in populations which retained the ability to induce SV40 T antigen in the cytoplasm of cells, indicating that the localization of the SV40 T antigen was under the control of the defective SV40 genome. The cytoplasmic localization of SV40 T antigen did not appear to influence the enhancement of adenovirus replication in simian cells by SV40 information. Attempts to detect an altered localization of cytoplasmic or nuclear SV40 T antigen after coinfection of cells with different virus mixtures, by sequential harvests of infected cells, or after treatment with cycloheximide were not successful.

5595 MICROCHEMICAL STUDIES OF LIPIDS, PROTEINS AND NUCLEIC ACIDS IN POLYOMA VIRUS-TRANSFORMED HAMSTER ASTROGLIA. (E.) Embree, L. J. (McLean Hosp. Res. Lab., Belmont, Mass.), H. H. Hess and H. M. Shein. *J Neuropathol Exp Neurol* 32(4):542-551, 1973.

Quantitative microchemical analyses of biochemical structural components were performed on experimental astrocytomas produced by s.c. growth in hamsters of two hamster astroglial cell lines separately transformed *in vitro* by polyoma virus. Tumors from Line 1 were well differentiated, those from Line 2 were anaplastic. Astrocytomas from both cell lines possessed characteristic astrocytic morphology, were free from contamination by other neural tissue elements and relatively free from necrosis. Expressed as a % of dry wt, the Line 2 tumors significantly exceeded the Line 1 tumors in content of DNA (3.13 and 2.28%), RNA (3.30 and 2.06%), phospholipid (6.94 and 5.08%), and residue protein (62.5 and 58.0%). The phospholipid:cholesterol molar ratios were 2.0 and 1.6 in the Line 2 and Line 1

tumors, resp. Proteolipid protein comprised only 1% of the total protein content of the tumors. The mean content of ganglioside sialic acid in the tumors was 33-40% as great as in brain white matter, 17% as great as in gray matter. The molar ratio of ganglioside sialic acid to ceramide hexose averaged 1:6.3 in the anaplastic Line 2, and 1:3.9 in Line 1. The high levels of nucleic acids and low levels of phospholipids in the experimental tumors are similar to those reported in specimens of human spontaneous astroglomas.

5596 TYPE-C VIRUS IN CULTURED CELLS DERIVED FROM NORMAL AND TUMOR CELLS OF A RAT. (E.)

Oboshi, S. (Path. Div., Natl. Cancer Ctr. Res. Inst., Japan), K. Miyamoto, K. Yanagihara, T. Seido, K. Yoshida, J. Inoue, N. Kuga and S. Watanabe. *Gann* 64(5):515-517, 1973.

Subcultured E cells derived from the aortic intima of a normal male Donryu rat and SLC cells derived from a lung tumor in a similar rat were examined by electron microscopy. The E cells, which generally contained the diploid number of chromosomes, were inoculated s.c. into irradiated rats which had received an s.c. injection of cortisone. The tumors thus produced resembled human angiosarcomas and were successfully transplanted into nonconditioned rats. Tumor cells derived from SLC-inoculated nonconditioned rats contained particles which resembled mature and immature C-type particles of the murine leukemia viruses. The particles, which were usually found extracellularly, were also seen budding from the cell membrane. The virus particles were seen more frequently in SLC cells than in E cells. However, the number of particles was significantly decreased in tumor tissues derived from inoculation with E and SCL cells. Conversely, the number of particles increased in E and SLC derived tumor cells cultured *in vitro*. Treatment with 5-bromo-deoxyuridine (BUDR) resulted in an increased number of particles in cell grown *in vitro*. The BUDR treated cells also contained intracisternal A-type particles.

5597 RD-114 VIRUS: ANALYSIS OF VIRAL GENE SEQUENCES IN FELINE AND HUMAN CELLS BY DNA-DNA REASSOCIATION KINETICS AND RNA-DNA HYBRIDIZATION. (E.) Fujinaga, K. (St. Louis U. Sch. Med., Mo.), A. Rankin, H. Yamazaki, K. Sekikawa, J. Bragdon, and M. Green. *Virology* 56(2):484-495, 1973.

To investigate the host species of origin of RD-114 virus and its relationship to other oncornaviruses, molecular hybridization and reassociation kinetic experiments were performed using three radioactive probes: the double stranded (ds) and single stranded (ss) DNA products of the viral RNA-directed DNA polymerase, and the viral 60-70 S [³H]RNA genome. DNA was synthesized by the endogenous DNA polymerase reaction of purified RD-114 virions disrupted with detergent and dsDNA was isolated by hydroxyapatite chromatography. The most efficiently transcribed dsDNA segment represented approximately 50% or more of dsDNA transcripts and had a sequence complexity of about 0.8×10^6 daltons. The RD-114 cell line

which chronically produces RD-114 virus contains 20-30 copies of this DNA sequence, while normal feline tissues contain 100-200 copies. Less than one copy of DNA sequences homologous to this RD-114 viral dsDNA segment were detected in uninfected human, hamster, and rat cells. RD-114 viral [³H]ssDNA did not hybridize significantly with RNA of several strains of feline and murine leukemia and sarcoma viruses. RD-114 viral 60-70S [³H]RNA hybridized to the same extent and with similar kinetics to RD-114 cell and feline tissue DNA indicating that similar numbers of copies of most, if not all, of the RD-114 viral genome, are present in normal feline cells as well as in RD-114 virus-producing human cells. No hybridization was detected between RD-114 viral 60-70S RNA and the DNA of the parental human RD cell line, or the DNA of uninfected human, hamster or rat cells. Thus, the RD-114 virus incorporates less than 10% human cell DNA sequences even after replicating in human cells for many generations. It is concluded that the major portion of the RD-114 virus genome is of feline derivation, that it shares base sequences with a repetitive class of normal feline cell DNA, and that it is genetically distinct from known isolates of feline leukemia-sarcoma viruses. These properties suggest that the RD-114 virus is an endogenous virus of normal feline cells.

5598 LACK OF SEQUENCE HOMOLOGY AMONG RNAs OF AVIAN LEUKOSIS-SARCOMA VIRUSES, RETICULO-ENDOTHELIOSIS VIRUSES, AND CHICKEN ENDOGENOUS RNA-DIRECTED DNA POLYMERASE ACTIVITY. (E.) Kand, C.-Y. (McArdle Lab. Cancer Res., U. Wisconsin, Madison) and H. M. Temin. *J Virol* 12(6):1314-1324, 1973.

The relatedness of the RNAs of the three avian systems (including six avian leukosis-sarcoma viruses, four reticuloendotheliosis viruses, and the microsome fraction of normal uninfected chicken embryo cells) containing RNA and a DNA polymerase were studied by nucleic acid hybridization. All six avian leukosis-sarcoma viruses have closely related nucleotide sequences as do all four reticuloendotheliosis viruses. But, almost no similarities were detected between the RNAs of the avian leukosis-sarcoma viruses and reticuloendotheliosis viruses. The RNA template of the endogenous RNA-directed DNA polymerase activity of normal uninfected chicken cells had no detectable relationship to the RNAs of the avian leukosis-sarcoma and reticuloendotheliosis viruses.

5599 ADENOVIRUS PROTEIN METABOLISM AT NON PERMISSIVE TEMPERATURE. II. TRANSFER OF VIRAL POLYPEPTIDES TO NUCLEUS AND EVIDENCE FOR A THERMOSTABLE INFECTED CELL SPECIFIC POLYPEPTIDE. (E.) Warocquier, R. (Virology Res. Unit, Inserm, Lille, France) and P. A. Boulanger. *Arch Gesamte Virusforsch* 41(4):371-381, 1973.

Exponentially growing KB cells were infected with adenovirus type 2 and maintained at 37 or 42 C for 18 hr. Incubation at 42 C inhibited the multiplication of adenovirus particles in lytically infected cells, although viral DNA and polypeptides were present in the cytoplasm. The transport of viral

polypeptides from the cytoplasm, where they are synthesized, to the nucleus, where the viral particles are assembled, was not blocked at 42 C. The relative amounts of the viral polypeptides present in the nucleus were higher at 42 C than at 37 C, indicating that a thermic regulation may act during the synthesis of proteins in the cytoplasm. A particular infected cell specific polypeptide, non-capsid viral polypeptide-1 (NCVP-1), which migrates close to the hexon polypeptide, was detected in cells incubated at both temperatures. NCVP-1 had a rapid turn-over rate and did not seem to be metabolically related to hexon. The observed decrease in the synthesis of hexon as compared to the other virus polypeptides could not be attributed to a feedback inhibition. The diminution in the synthesis of the polypeptides may result from a blockage of ribosome turnover, which occurs as soon as infected or uninfected cells are incubated at 42 C.

5600 PRIMARY BRAIN AND SPINAL CORD TUMORS INDUCED BY HUMAN ADENOVIRUS TYPE 12 IN HAMSTERS. (E.) Mukai, N. (Retina Fdn., Boston, Mass.) and S. Kobayashi. *J Neuropathol Exp Neurol* 32(4): 523-541, 1973.

Twenty-nine (37%) of 78 newborn hamsters developed an autochthonous malignant tumor of the central nervous system within 31 to 204 days after a single intracerebral inoculation of 0.01 ml of human adenovirus type 12 fluid, containing $10^{3.5}$ - $10^{4.5}$ TCID₅₀ HeLa cells/0.1 ml. Eight solid tumors protruding into the ventricular system developed in the left cervical hemisphere where the virus was inoculated. In one case, entirely separate tumors were found in both hemispheres. Four tumors were small incipient neoplasms located immediately adjacent to the ventricular system. Two appeared to block entirely the IVth ventricle. Three were situated in the medulla oblongata. Sixteen spinal cord tumors were found, mainly in the dorsal half of the column. Histopathological studies of all these tumors showed a remarkable uniformity. The tumors were designated as the counterpart of human embryonic gliomas derived from the ependymal anlage. The presence of cilia of neuronal origin suggests that these tumor cells mimic certain developing neurons. The presence of numerous intracytoplasmic filaments and microtubules in dysplastic neuronal cells also suggests a neuronal origin. Detection of immunofluorescent T-antigen confirmed the viral origin of the tumor. S.C. transplantation of the tumor gave rise to rapid neoplastic growth in recently weaned hamsters.

5601 TUMOR REJECTION AND IMMUNOTHERAPY STUDIES WITH SIMIAN VIRUS 40-INDUCED TUMORS. (E.) Blakeslee, J. R. (Roswell Park Mem. Inst., Buffalo, N.Y.), W. von Muenchhausen and H. R. Cox. *J Med (Basel)* 4(4):233-247, 1973.

Tumor rejection tests were used to further investigate the findings of Cox *et al.*, that foreign cells injected with irradiated tumor cells into hamsters increase the level of protection against subsequent

tumor cell challenge, as compared to hamsters immunized only with irradiated tumor cells. The administration of xenogeneic cells to Syrian golden hamsters prior to inoculation with irradiated tumor cells increased the level of protection against subsequent tumor cell challenge by 10- to 100-fold as compared to the administration of tumor cells alone; similar results were obtained when equal mixtures of xenogeneic and tumor cells were injected. The 'enhancing' of the 'primer' effect of the xenogeneic cells was not radiosensitive. Human, reptilian, and bacterial cells enhanced the immune response equally well. A 5-fold increase in both xenogeneic and tumor cells above the standard dose of 60 million cells resulted in apparent immunological paralysis in vaccinated hamsters, as manifested by the inability of this group to resist viable tumor cell challenge. The prior sensitization of experimental hamsters to xenogeneic cells, followed by the incorporation of the same xenogeneic cells into mixtures with irradiated tumor cells and use of these as immunotherapeutic vaccines, did not result in any delay or suppression of tumor growth when the vaccines were inoculated into tumor-bearing hamsters by either subcutaneous, intramuscular, or intradermal routes. Autogenous vaccine therapy was unsuccessful in inducing the regression or elimination of residual tumor.

5602 MITOCHONDRIAL DNA SYNTHESIS IN RAJI CELLS INFECTED BY HERPES SIMPLEX VIRUS OR EPSTEIN-BARR VIRUS. (E.) Radsak, K. (Hygiene Inst., U. Marburg, Germany) and H. Freise. *Med Microbiol Immunol* 159(1):45-51, 1973.

Approximately 10^8 viable Raji cells were infected with either herpes simplex virus (HSV) or Epstein-Barr-Virus (EBV). Mitochondrial DNA synthesis was stimulated during the first 12 hr pulse post infection with HSV. At later post infection times this synthesis was progressively inhibited, probably due to viral cytopathogenicity. Nuclear DNA synthesis was already inhibited during the first pulse post infection. Of all the Raji cells infected with HSV, 50-56% exhibited HSV-antigen. Superinfection with EBV did not cause initial post infection stimulation of mitochondrial DNA synthesis. A progressive inhibition of mitochondrial DNA synthesis and nuclear DNA synthesis did occur. Of these cells, 26-33% were EA-positive. Comparison of acid-soluble radioactivity in HSV- and EBV-infected Raji cells suggests that the mitochondrial reactions observed might not only be a result of virus-induced nucleotide pool alterations. Decreasing mitochondrial synthesis at later times could result from progressive viral cytopathogenicity. For the EBV-infected Raji cell system, viral inhibitors of cellular macromolecular synthesis are postulated also.

5603 C-TYPE PARTICLES IN MULTIPLE PRIMARY TUMOURS OF BALB/c MICE. (E.) Ribacchi, R. (Med. Sch., 1'Aquila U., Italy). *Vth Perugia Quadrennial Intl Conference on Cancer* 69, 1973.

5604 TYPE OF TUMOURS CAUSED BY MOLONEY LEUKAEMIA-SARCOMA VIRUS COMPLEX AND POSSIBLE INFLUENCE OF MAMMARY TUMOR VIRUS. (E.) Tsubura, Y. (Nara Med. Coll., Japan), T. Fukuyama and H. Hatada. *Vth Perugia Quadrennial Intl Conference on Cancer* 70, 1973.

5605 INTRACRANIAL PRIMARY MULTIPLE TUMORS INDUCED BY ROUS SARCOMA VIRUS IN MAMMALS. (E.) Rabotti, G. F. (Coll. France, Exp. Med. Lab., Paris). *Vth Perugia Quadrennial Intl Conference on Cancer* 74, 1973.

5606 MULTIPLE PRIMARY RENAL SARCOMAS IN RATS: A DOSE-RESPONSE STUDY WITH POLYOMA VIRUS. (E.) Georgii, A. (Med. High Sch., Hannover, Germany) and H. Ostertag. *Vth Perugia Quadrennial Intl Conference on Cancer* 73, 1973.

5607 INDUCTION OF LYMPHOMA WITH LYMPHOCYTIC LEUKEMIA IN OWL MONKEYS WITH HEATED, NON-CYTOPATHOGENIC HERPESVIRUS SAIMIRI. (E.) Ablashi, D. V. (Natl. Inst. Hlth., Bethesda, Md.), W. F. Loeb, G. Pearson, M. G. Valerio, G. R. Armstrong, H. Habin, E. W. Kingsbury and U. Heine. *Vth Perugia Quadrennial Intl Conference on Cancer* 72, 1973.

5608 DUAL ACTION OF MOUSE MAMMARY TUMOUR VIRUS (MTV) ON INDUCTION OF MAMMARY CANCER AND LEUKAEMIA IN STRAIN ICRC. (E.) Pai, S. R. (Cancer Res. Inst., Tata Mem. Ctr., Bombay, India) and K. J. Ranadive. *Vth Perugia Quadrennial Intl Conference on Cancer* 71, 1973.

5609 A VIRUS IN HUMAN TUMOR CELL LINES WITH BIO-CHEMICAL PROPERTIES OF THE ONCOGENIC RNA VIRUSES. (E.) Stewart, S. E. (Georgetown U., Washington, D.C.), G. Kasnic, Jr. and C. Urbanski. *Vth Perugia Quadrennial Intl Conference on Cancer* 106, 1973.

5610 AN EVALUATION OF THE POSSIBLE ROLE OF EB VIRUS IN THE AETIOLOGY OF VARIOUS HUMAN TUMOURS. (E.) Epstein, M. A. (Dept. Path., Bristol U., England). *Vth Perugia Quadrennial Intl Conference on Cancer* 103, 1973.

5611 GLIOMAS AND MENINGIOMAS INDUCED IN DOGS BY ROUS SARCOMA VIRUS. CLASSIFICATION BASED ON ULTRASTRUCTURE. (E.) Haguenau, F. (Coll. France, Exp. Med. Lab., Paris). *Vth Perugia Quadrennial Intl Conference on Cancer* 75, 1973.

5612 HOST-GENE CONTROL OF MURINE TYPE C RNA TUMOR VIRUS EXPRESSION AND TUMORIGENESIS. GENOTYPIC PROGRAMMING FOR SINGLE AND MULTIPLE PRIMARY TUMORS. (E.) Meier, H. (Jackson Lab., Bar Harbor, Me.), B. A. Taylor, H. W. Chen, H. J. Heiniger, B. A. Diwan and M. Cherry. *Vth Perugia Quadrennial Intl Conference on Cancer* 68, 1973.

5613 RETICULAR NEOPLASMS ASSOCIATED WITH A TRANSPLANTABLE MAMMARY ASCITES CARCINOMA (ATPC+). (E.) Maltzeff, N. (Med. Sch., Perugia U., Italy). *Vth Perugia Quadrennial Intl Conference on Cancer* 49, 1973.

5614 MULTIPLE CANCER IN THE MAMMARY GLAND SYSTEM: A MURINE MODEL SUITABLE FOR HUMAN BEINGS. (E.) Squartini, F. (Med. Sch., U. Pisa, Italy). *Vth Perugia Quadrennial Intl Conference on Cancer* 34, 1973.

See also:

- * (Rev): 5401, 5407, 5411, 5419, 5420, 5421, 5424
- * (Immun): 5623, 5626, 5635, 5649, 5654, 5665, 5666, 5678, 5696, 5697, 5704
- * (Epid-Biom): 5753

- 5615 B LYMPHOCYTES IN UNTREATED PATIENTS WITH MALIGNANT LYMPHOMA AND HODGKIN'S DISEASE. (E.) Gajl-Peczalska, K. J. (Dept. Pathol., U. Minnesota, Minneapolis), J. A. Hansen, C. D. Bloomfield and R. A. Good. *J Clin Invest* 52(12):3064-3073, 1973.

B and T lymphocytes in 37 untreated patients with malignant lymphoma and Hodgkin's disease were studied. B cells in the peripheral blood were investigated with respect to surface immunoglobulins and in a few patients with respect to intracytoplasmic immunoglobulins by means of immunofluorescence. T cell function was studied by direct phytohemagglutinin microtest (from the same sample of whole blood), mixed lymphocyte culture, and by delayed hypersensitivity to various antigens. In the 13 patients with Hodgkin's disease the histologic subtype was nodular sclerosis in nine, lymphocyte predominant in two, mixed cellularity in two. Only one of these patients had disseminated disease (stage IV); he showed impaired cellular immunity, a very low percentage of B cells and low levels of serum immunoglobulins. Of the remaining patients with Hodgkin's disease, with one exception, normal percentages but rather low absolute numbers of B lymphocytes per mm³ of blood were found. One patient with a low percent and low absolute number of B lymphocytes showed very high serum IgG. Of 24 patients with non-Hodgkin's malignant lymphoma, seven (29%) showed monoclonal B cell proliferation in the peripheral blood (five μ κ, two γ κ). By morphologic criteria, 14 patients had involvement of bone marrow, five of these had involvement of peripheral blood. Four of the latter five patients showed marked increases in percentages and absolute numbers of B lymphocytes in the peripheral blood reflecting the monoclonal proliferation. In three additional patients monoclonal proliferation of lymphocytes was found by immunofluorescence although the blood smears appeared morphologically normal. Serum immunoglobulin abnormalities without monoclonal B cell proliferation in the peripheral blood were observed in six patients.

- 5616 IMMUNOPOTENTIATION WITH BCG. II. MODULATION OF THE RESPONSE TO SHEEP RED BLOOD CELLS. (E.) Miller, T. E. (Trudeau Inst. Saranac Lake, N.Y.), G. B. Mackaness and P. H. Lagrange. *J Natl Cancer Inst* 51(5):1669-1676, 1973.

The immunologic response to sheep red blood cells (SRBC) was used to study the immunopotentiating action of BCG. The wave of cell proliferation, which preceded by 24 hr the production of direct plaque-forming cells (PFC) in the murine popliteal lymph node, was amplified about threefold in nodes primed by a previous footpad inoculation of living BCG; the total numbers of direct and indirect PFC in the node at peak production were increased approximately 15-fold. The response to SRBC was associated with a delayed type of hypersensitivity (DTH) mediated by θ -bearing cells. In unprimed animals, DTH (measured as increased footpad thickness) was maximal within six days, but reached a much higher maximum (threefold) within four days in animals primed with BCG. Potentiation occurred only when BCG and SRBC reached the same regional

node. Cell proliferation in responding nodes correlated closely with resulting levels of DTH. As cell proliferation in response to BCG increased, cell response increased proportionally to super-added stimulation by SRBC. Maximum potentiation was achieved when SRBC were introduced on day 14 of the response to BCG. It is concluded that BCG infection in a regional node greatly facilitates the recruitment of T cells to a second antigenic stimulus; thus one immune response is driving the other by some (presumably) nonspecific mechanism.

- 5617 HIGH PREVALENCE OF ANTIBODIES TO BK VIRUS, AN SV40-RELATED PAPOVAVIRUS, IN RESIDENTS OF MARYLAND. (E.) Shah, K. V. (Johns Hopkins U. Sch. Hygiene and Public Health, Baltimore, Md.), R. W. Daniel and R. M. Warszawski. *J Infect Dis* 128(6):784-787, 1973.

Sera from 334 healthy residents of three widely separated counties in Maryland were tested for the presence of HAI antibodies to BK virus, an SV40-related papovavirus. By the age of 3 yr, 50% of the children had acquired antibodies, and by the age of 10-11 years, all had acquired them. The prevalence declines in the older age groups and dropped to 67% in those aged 35 yr or older. The titers ranged from 1:20 to 1:2560 and tended to be higher in younger individuals. The results of the HAI tests correlated well with those of two types of neutralization tests and fairly well with indirect fluorescent antibody tests. The results indicate that infection with BK virus is common in early childhood.

- 5618 DETECTION OF CIRCULATING ANTIBODIES IN CEREBROSPINAL FLUID IN TUMORS AND INFLAMMATORY DISEASES OF THE BRAIN. (Rus.) Grinberg, S. A. (Kazan Sci. Res. Inst. Traumatology Orthopedics, USSR). *Kazan Med Zh* (5):19-20, 1973.

Circulating hemagglutinating antibodies were studied in cerebrospinal fluid from 20 patients with brain tumors and 18 patients with inflammatory brain diseases. Boyden's reaction was carried out with antigen from normal brain tissue, an arachnoid endothelioma, and a glioma. Boyden's reaction with arachnoid endothelioma antigen was positive in 13 of the 20 patients with brain tumors and in only 6 of the 18 with inflammatory brain disease. The corresponding results with glioma antigen were 12 of 20 and 5 of 18, resp. Ten patients in each group had positive reactions to antigen from normal brain tissue. Thus, Boyden's reaction with tumor antigen was positive in the cerebrospinal fluid of a higher percentage of patients with brain tumors than in those with inflammatory diseases of the brain, while among patients with inflammatory brain diseases Boyden's reaction with antigen from normal brain tissue was positive in twice as many patients as the reactions with tumor antigen. It is suggested that the use of Boyden's reaction with normal and tumor antigens on cerebrospinal fluid and serum might be used as a supplementary diagnostic test for brain tumors.

5619 RELATIONSHIP BETWEEN KILLER AND ROSETTE-FORMING CELLS REACTIVE TO H-2 ANTIGENS.

(E.) Brondz, B. D. (N. F. Gamaleya Inst. Epid. Microbiol., Moscow, USSR), I. F. Kotomina, L. S. Jeliseyeva, S. G. Egorova and A. E. Snegirëva. *Scand J Immunol* 2(5):463-477, 1973.

Optimum conditions were selected for testing direct and indirect H-2 reactive rosette-forming cells (RFC) using sheep or mouse erythrocytes coated with soluble H-2 antigens. Rosette formation with mouse erythrocytes is an immunologically specific reaction and is inhibited by pretreatment of the cells with the corresponding soluble H-2 antigen preparation. The rate of killer cell and RFC formation is different after primary and secondary immunization with an allogeneic tumor. Unlike killer cells, RFCs are inactivated without complement by rabbit antibodies against mouse γ -globulin (MGG). In contrast to killer cells, which are eliminated in the presence of complement by anti- θ antibodies but not by anti-plasma cell antigen (PC.1) and anti-MGG antibodies, direct RFCs are not inactivated by anti- θ but are eliminated partially by anti-MGG and anti-PC.1. The RFCs are concentrated in the low-density fractions of the discontinuous bovine serum albumin gradient, whereas cytotoxic lymphocytes are distributed less closely, being concentrated in the intermediate fraction, which does not differ morphologically from the initial cell suspension. Killer and rosette-forming cells reactive to the same H-2 antigens appear to be two non-overlapping populations of T and B cells, respectively, and no T-B cooperation is required for the destruction of target cells.

5620 *IN-VITRO* PRODUCTION OF CARCINOEMBRYONIC ANTIGEN BY NORMAL AND NEOPLASTIC COLON.

(E.) Breborowitz, J. (Chester Beatty Res. Inst., London, England), G. C. Easty and A. M. Neville. *Lancet* (7842):1393, 1973.

The double-antibody immunoassay technique was used to confirm earlier reports of the production and release of carcinoembryonic antigen (CEA) by monolayer and organ cultures of colorectal carcinomas. Well-differentiated colonic carcinoma cultures (0.5 gm) produced about 40 μ g/day CEA compared to about 24 μ g/day for normal mucosa. CEA produced *in vitro* showed immunological and gel filtration elution properties similar to those of CEA extracted from colonic tumors. CEA was demonstrable by light microscopy on normal and carcinomatous colonic mucosal cells using an immunoperoxidase cytochemical method with goat anti-CEA antisera. Results suggest that CEA may be present in the normal plasma membrane but may be masked in some manner, being measurable only after its release.

5621 STIMULATION OF CELLS BY ANTIBODY. (E.)

Shearer, W. T. (Washington U. Sch. Med., St. Louis, Mo.), G. W. Philpott and C. W. Parker. *Science* 189(4119):1357-1359, 1973.

Mouse L-929 cells incubated in heat-inactivated fetal calf serum with rabbit antiserum against L cells de-

monstrated an increased cellular incorporation of (125 I)iododeoxyuridine ((125 I)IdU) and (3 H)thymidine ((3 H)dT); these incorporation rates represented up to 200-fold increases over those seen when L cells were incubated with normal rabbit serum. Similar results were obtained when 2,4,6-trinitrophenyl (TNP)-substituted L cells were exposed to antibody against TNP, and when HeLa, HEp-2, and MOPC-315 cells were exposed to rabbit antisera against HeLa, HEp-2, and MOPC-315 cells, resp. Cell counts indicated that the antibody-treated cells grew faster than the control cells from the outset and that by the second day, the differences had become highly significant. The stimulation of (125 I)IdU and (3 H)dT uptake was immunologically mediated, and the data suggest that the stimulating factor in the rabbit antiserum was the antibody *per se*. Previous data indicate that the large increases in radioactive nucleoside uptake may be due in part to increased nucleoside transport, although cell proliferation was also being stimulated. It is concluded that antibodies specific for cell surface antigens can induce the cell to undergo DNA synthesis and cell division and that the antigenic determinants involved may be similar on the several different cell lines that show immunologic cross-reactivity (i.e., L-929, HEp-2, and MOPC-315).

5622 EFFECT OF THYMECTOMY, IRRADIATION AND IMMUNIZATION OF THE C3H/He LINE OF MICE ON THE DEVELOPMENT OF SYNGENEIC TUMORS OF THE MAMMARY GLANDS.

(Rus.) Gruntenko, E. V. (No affiliation). *Vopr Onkol* 19(9):102, 1973.

At age 5.5 months, 156 male C3H/He mice were injected with syngeneic mammary tumor. One group of 62 mice was immunized by inoculation of tumors from F₁ hybrid mice (C3H x C57B1) for two months before inoculation of the syngeneic tumors. A second group of 35 mice was immunized with skin transplants from C57B1 x C3H hybrids. A group of 59 nonimmunized mice served as controls. Each of these groups were then divided into three subgroups, one of which was thymectomized at age 2.5 months and exposed to 360 r of x-rays one month later. The second subgroup was not thymectomized but was exposed to radiation, and the third subgroup received no further treatment. Neither immunization with semi-syngeneic mammary tumor or skin transplantation had any effect on the development of syngeneic mammary tumors. Syngeneic tumor development was suppressed by irradiation or thymectomy.

5623 MEMBRANE ANTIGENS IN ARGININE-DEPRIVED CULTURES INFECTED WITH MAREK'S DISEASE

HERPESVIRUS. (E.) Mikami, T. (Sapporo Med. Coll., Japan), M. Onuma and T. T. A. Hayashi. *Nature [New Biol]* 246(155):211-212, 1973.

The effect of arginine deprivation on synthesis of membrane antigen (MA), viral structural antigen (VSA), viral DNA, and formation of multinucleated cells (MNC) was studied in Marek's disease herpesvirus-infected Japanese quail embryo fibroblast monolayer cultures. Whereas the number of cells synthe-

sizing MA, as determined by fluorescent antibody staining, showed two peaks at 8 and 16 hr after infection for arginine-supplemented and iododeoxyuridine (IUdR)-treated controls, only a single peak at 20 hr was observed for arginine-deprived cells. Very few arginine-deprived cells synthesized VSA. The number of MA-positive cells synthesizing viral DNA in arginine-deficient cells plateaued at 36 hr, whereas the number in cultures with arginine continued to increase. The number of MNC in arginine-deficient cultures increased to a maximum at 24 hr and thereafter declined to IUdR-treated control levels. MNC continued to rise after 24 hr in arginine-treated controls. These results suggested that the MA described is a newly synthesized protein coded by both an early and late function of the viral genome and that the alteration of the cell surface following viral DNA synthesis may result in MNC formation in infected cultures.

5624 A UNIQUE 'LEUKAEMIC' T LYMPHOID CELL LINE: ABSENCE OF STIMULATING EFFECT IN MIXED LYMPHOCYTE REACTION. LACK OF MLR-S IN LEUKAEMIC T LYMPHOID CELLS. (E.) Han, T. (Dept. of Med. B, Roswell Park Memorial Inst., Buffalo, N. Y.) and J. Minowada. *Clin Exp Immunol* 15(4):535-541, 1973.

Mixed lymphocyte cultures consisting of fresh peripheral blood lymphocytes from healthy humans or baboons and the following human cultured lymphoid cell lines were set up: B411-4 (normal B lymphoid cells); B35M (Burkitt's lymphoma B lymphoid cells); and MOLT-4 ('leukemic' T lymphoid cells). The cultured cells were irradiated with 6000 rad or treated with mitomycin C to create 'one-way' reactions. (³H)Thymidine was added to each culture 24 hr prior to harvesting, and the incorporation of the label into the cellular DNA measured. No stimulating effect of MOLT-4 lymphoid cells on allogeneic lymphocytes was noted, while the lymphocytes from the same donors were significantly stimulated by B411-1 lymphoid cells and B35M lymphoid cells. MOLT-4 cells treated with *Vibrio cholerae* neuraminidase (VCN) also failed to exert a stimulating effect on lymphocytes treated with VCN or phosphate-buffered saline. Treatment of the lymphocytes alone or of both the lymphocytes and B411-4 or B35M cells with VCN significantly enhanced the 'one-way' mixed lymphocyte reaction (MLR); however, the VCN treatment of the B411-1 or B35M cells alone did not enhance the reaction. The data indicate that the MLR stimulating determinant of leukemic cells may have been lost or masked during the process of leukemogenesis or during *in vitro* cultivation.

5625 LOCALIZATION OF I¹²⁵ LABELLED ANTIBODIES AGAINST TUMOR-ASSOCIATED PROTEINS FROM EXPERIMENTAL RAT MAMMARY NEOPLASMS. (E.) Kellen, J. A. (Dept. Clin. Biochem., U. Toronto, Canada) and J. S. Lo. *Res Commun Chem Pathol Pharmacol* 5(2):411-420, 1973.

Homogenates and soluble proteins from transplanted R-35 and R3230AC mammary tumors were used to immunize adult New Zealand rabbits. The antisera thus pro-

duced were labelled with I¹²⁵ and injected *in vivo* into the tail veins of normal and mammary tumor bearing Sprague-Dawley rats. Following the injection of the labelled globulins, the radioactivity in the blood and urine was high and persisted for at least 6 days. The accumulation of radioiodine in the brain, thymus, muscle, thyroid, and regional lymph nodes was minimal. Of the parenchymous organs, the accumulation was highest in the kidney, and next highest in the liver and spleen. High levels of radioactivity were found in the ovaries and mammary glands, with the levels in the tumors exceeding those in all other organs. The antiserum obtained using homogenates of R-35 tumors as antigen cross-reacted with dimethylbenz(a)anthracene-induced tumors, although the accumulation of tracer was relatively low. The binding of the antiserum obtained through immunization with the soluble protein fraction from the R3230AC tumors exceeded that observed with the other antiserum by 35 to 50%, thus the soluble tumor proteins contained antigens closer in character to the tumor. The accumulation of NaI¹²⁵ in normal and tumor-bearing rats was negligible.

5626 EFFECT OF VARIOUS ENZYMES AND CHELATING AGENTS ON SV40 TUMOR-SPECIFIC TRANSPLANTATION ANTIGENS. (E.) Blakeslee, J. R., Jr. (Roswell Park Memorial Inst., Buffalo, N.Y.), W. von Muenchhausen and H. R. Cox. *J Med* 4(5):261-265, 1973.

Seven enzymes (ficin, pancreatin, collagenase, bromelain, hyaluronidase, papain, α-chymotrypsin) and two chelating agents (sodium tetraphenyl boron, disodium ethylenediamine tetraacetate) were used to disperse solid simian virus 40 (SV-40)-induced tumors to single cell suspensions, after which the effect on tumor-specific transplantation antigens (TSTA) was determined by tumor rejection tests in weanling hamsters. Only vaccines prepared from trypsin-dispersed cells were capable of protecting the animals against subsequent tumor cell challenge; the vaccines prepared from tumor cells dispersed with the other test enzymes or chelating agents offered no protection. However, the cells dispersed by all the enzymes and chelating agents retained their oncogenicity in that they were able to induce tumors in young weanling hamsters.

5627 OCCURRENCE AND DISTRIBUTION OF CARCINOEMBRYONIC ANTIGEN (CEA) AND A PERCHLORIC ACID-SOLUBLE ANTIGEN OF NORMAL COLONIC MUCOSA (NC) IN CARCINOMAS AND POLYPS OF THE LARGE INTESTINE. (Ger.) Tappeiner, G. (Inst. Pathol. Anat., U. Vienna, Austria), H. Denk, R. Eckerstorfer and J. H. Holzner. *Virchows Arch (Pathol Anat)* 360:129-140, 1973.

Indirect immunofluorescence was used to compare the occurrence and distribution of a perchloric acid soluble antigen of normal colonic mucosa (NC) with those of carcinoembryonic antigen (CEA) in 42 carcinomas and 4 polyps of the large intestine. In contrast to CEA, which was found in carcinomas, regardless of their degree of differentiation, the

occurrence of NC was correlated with the degree of tumor differentiation. In some instances NC was not found at all in highly differentiated carcinomas which contained CEA, but was present in large amounts in the cytoplasm of tumor cells which were morphologically similar to goblet cells. NC was also found as "lakes" between tumor cells in poorly differentiated, anaplastic carcinomas with a tendency to produce mucus. NC was present in mucus from all mucus-producing tumors regardless of their degree of differentiation. In polyps, NC was present in goblet cells while CEA was present in lumen-like parts of goblet cells in normal mucosa adjacent to the tumor and in benign polyps and those undergoing malignant degeneration. It is not known whether this CEA was produced by normal epithelial cells in the colon or whether it was secreted from the adjacent tumor. The presence of CEA in tumors of the large intestine, regardless of their degree of differentiation, suggests that all carcinomas of the large intestine produce CEA but only certain carcinomas secrete it.

- 5628 CARCINOEMBRYONIC ANTIGEN (CEA) "FINGERPRINTS". (E.) Rule, A. H. (Tufts-New England Med. Ctr., Boston, Mass.) and C. Goleski-Reilly. *Br J Cancer* 28(5):464-468, 1973.

Carcinoembryonic antigen (CEA) "fingerprints" were obtained by electrofocusing saline extracts from tumors and normal tissues and performing CEA radioimmunoassays on each fraction. The CEA fingerprint from the saline extract obtained from a pool of 20 primary carcinomas of the colon showed seven major peaks (containing significant amounts of CEA activity) and six minor peaks; the major peaks occurred at pH 3.0, 4.0, 4.5, 5.0, 6.0, 7.0, and 8.0, while the minor peaks occurred at pH 2.0, 2.5, 5.5, 6.5, 7.5, and 9.0. The CEA fingerprint of normal colonic tissue showed major peaks at pH 3.5 and 6.5, with minor peaks at pH 2.0, 2.5, 4.5, 5.0, 5.5, and 6.5; most notably lacking were peaks at pH 3.0 and 4.0. The CEA fingerprint of fetal gut tissue showed major peaks at pH 2.0, 4.0, 5.0, and 6.5, with minor peaks at pH 7.5, 8.0, and 8.5; CEA activity was most noticeably lacking at pH 3.0. The CEA fingerprint of the perchloric acid extract of the colonic carcinomas showed a lack of clear separation between the CEA reacting peaks, even after extensive urea pretreatment. The use of CEA fingerprints to differentiate the excessive production of normal colon antigens from those of neoplastic origin remains a possibility with certain refinements of this technique.

- 5629 DETECTION BY IMMUNOFLUORESCENCE OF CARCINOEMBRYONIC ANTIGEN IN COLONIC CARCINOMA, OTHER MALIGNANT OR BENIGN TUMOURS, AND NON-CANCEROUS TISSUES. (E.) Bordes, M. (Fac. Med., Dijon, France), R. Michiels and F. Martin. *Digestion* 9(2):106-115, 1973.

The indirect fluorescence method was used to detect and localize carcinoembryonic antigen (CEA) in specimens of human colonic carcinoma, other malignant

or benign tumours, and non-cancerous tissues. The antigen was found in 39 specimens of colonic or rectal adenocarcinomas with a characteristic location at the apical pole of the cancerous cells. On the other hand, CEA was not detectable in two samples of anaplastic colonic carcinomas. Furthermore, CEA was occasionally found in some other digestive or non-digestive carcinomas. It was also present in 19 benign colo-rectal polyps examined and in the majority of 85 morphologically non-malignant colonic glands obtained from specimens excised for cancerous or non-cancerous diseases.

- 5630 A SEARCH FOR EMBRYONIC ANTIGENS IN REGENERATING INTESTINE OF THE ADULT LEOPARD FROG, *RANA PIPIENS*. (E.) Donaldson, D. J. (U. Tennessee Med. Units, Memphis), J. W. Minchey and K. Adcock. *Oncology* 28(6):523-535, 1973.

Separate antisera were raised against blastula, gastrula, and neurula stage frog embryos. After absorption with adult liver, kidney, brain, intestine, and oviduct, the antisera generally showed precipitin lines against the homologous antigens and adult skin but not against the other adult organs. Antisera absorbed with adult liver and kidney were positive to homologous antigens, adult oviduct, and skin, but not other adult organs. Further absorption of one of the latter antisera with skin left several homologous precipitin lines. Regenerating intestine always tested negative to antisera absorbed as described, even when homologous and adult skin reactivity was present. Antisera absorption with gravid ovaries removed homologous reactivity. This work indicates that frog embryos and ovarian eggs possess antigens in common, some of which are not found in adult tissues and at least one which is the same or similar to a component of adult skin. It further shows that regenerating intestine lacks these antigens or has them in significantly smaller amounts.

- 5631 IMMUNOLOGICAL ANALYSIS OF ACIDIC PROTEINS IN THE CHROMATIN OF ERLICH ASCITES TUMOR CELLS. (E.) Kono, N. (Sch. Med., Kanazawa U., Japan). *Gann* 64(3):293-296, 1973.

Acidic proteins isolated from the chromatin of Ehrlich ascites tumor cells were injected i.m. into albino rabbits once weekly for 4 wk and once 3 wk after the last weekly injection. Antisera from the rabbits were subjected to immunological assay by the double-diffusion technique in agar. Rabbit antiserum against the acidic proteins developed about six precipitation lines against either the acidic proteins or the acidic proteins in the chromatin of normal mouse liver cells. The absorbed antiserum gave only a single precipitation line against the acidic proteins. The acidic proteins were separated into four main fractions; the absorbed antiserum yielded a single precipitation line against two of these fractions, which contained the same antigen as that of the acidic proteins. The proteins in these two fractions were separated into seven major peaks by DEAE-cellulose column

chromatography, and a fraction containing the specific antigen was eluted. This fraction revealed a single precipitation arc when reacted with the antiserum by immunoelectrophoresis, and showed a single peak on ultracentrifugation with a sedimentation coefficient of 4.31S. This protein fraction contained a large amount of glutamic acid and aspartic acid, the ratio of acidic to basic amino acids being 1.64. The acidic protein antigen was found in the sera of Ehrlich ascites tumor-bearing mice of the dd, ddN, C3H, and C57BL strains, but was not found in the lungs, spleens, livers, or sera of normal mice. The nuclei of Ehrlich ascites tumor cells were characteristically stained by the direct fluorescent antibody method, while those of normal mouse liver cells were not stained at all.

- 5632 CARCINO EMBRYONIC ANTIGENS (CEA) AND NON-SPECIFIC CROSS-REACTING ANTIGENS IN FECES. (E.) Hirsch-Marie, H. (Lab. Immunochem. Res., CHU Saint-Antoine, Paris, France), G. Chavanel and P. Burtin. *Digestion* 9(3):193-198, 1973.

Ouchterlony double immunodiffusion studies were conducted on 61 perchloric acid soluble extracts from human feces and meconium to determine the presence of carcinoembryonic antigen (CEA) or CEA-like antigens. CEA was present in eight of 30 extracts from patients with cancer of the digestive tract, and in six of 31 extracts from normal patients, patients with nondigestive cancers, and from fetal or newborn meconium. Two antigens, designated NCA and NCA2, which cross-reacted with CEA were identified in 70-100% of all stool extracts and were thus considered as normal fecal constituents. It was concluded that the characterization of CEA or CEA-like antigens in stools by the double-immunodiffusion technique is unable to discriminate between those from cancerous and noncancerous patients.

- 5633 ON THE GRAFT-VERSUS-HOST NATURE OF THE ALLOGENIC EFFECT IN A TUMOUR ISOGRAFT SYSTEM. (E.) Medzihradsky, J. (Cancer Res. Inst., Slovak Acad. Sci., Bratislava), E. Konikova and L'. Novotna. *Neoplasma* 20(6):607-614, 1973.

MC-1 tumor cells were grafted i.m. into F1 hybrid rats resulting from Lewis-AVN crosses; some of the rats were simultaneously inoculated with Lewis parental spleen cells. In animals receiving tumor cells in combination with 50,000,000 parental spleen cells, there was a significant inhibition of tumor development. A nonsignificant inhibition was observed in animals inoculated with (AVN X LW)F1 spleen cells or only 500,000 to 5,000,000 parental spleen cells in combination with MC-1 tumor cells. Animals injected with 500,000,000 parental spleen cells in combination with tumor cells experienced facilitated tumor growth. The data suggest that the tumor inhibition followed a rather narrow graft-versus-host (GVH) inducing dose range. Both the immunosuppressive and immunostimulative effect of the GVH reaction may be associated with the host type lymphoid cell expansion during this reaction. During a strong GVH reaction, all peripheral T lymphocytes

might be affected, while a mild GVH reaction might destroy only those cells with more transplantation specificities (antigens) on the cell surface. In the former case, the T cell compensation by feedback stimulation of B precursors might take place; in the latter case, the precursor type of T lymphocytes might also be involved in the compensatory repopulation.

- 5634 EPSTEIN-BARR VIRUS AND INFECTIOUS MONONUCLEOSIS. (E.) Epstein, M. A. (U. Bristol, Med. Sch., England) and B. G. Achong. *Lancet* (7843):1437-1438, 1973.

The genome-containing cell in the peripheral circulation in infectious mononucleosis is neither the atypical cell nor a cell transformed by Epstein-Barr virus (EBV) *in vivo*; it is a nonproductively infected cell without viral genome expression, exactly like the peripheral lymphoid cells carrying the viral genome in any other seropositive individual. The authors did not mention the atypical cells of infectious mononucleosis in their published review of EBV since the cells are immunoreactive in origin and do not carry the EBV genome. These atypical cells appear to be of T-cell origin, while the genome-containing cells are probably of B-cell type.

- 5635 LOSS OF SUPPRESSOR FUNCTION AS A CAUSE OF LYMPHOID MALIGNANCY. (E.) Barnes, R. D. (Clinical Res. Ctr., Harrow, Middlesex, England) and M. Tuffrey. *Lancet* (7843):1437, 1973.

The hypothesis that leukemia is a reflection of loss of suppressor function was tested by ovum fusion of lymphoma-susceptible AKR mice and tumor-resistant CBA. Although the majority of cells in each of 18 AKR \times CBA chimeras were AKR, the incidence of lymphatic leukemia was greatly reduced in the chimeras. Cytogenetic analysis of peripheral blood-cultures after phytohemagglutinin stimulation showed an overwhelming preponderance of AKR cells. Analysis of other tissues gave similar results. In spite of being predominantly AKR in parental strain composition, tumors were suppressed by relatively few CBA cells. Suppressor cells thus appear to prevent the development of both progressive autoimmune and lymphoid neoplastic disease processes.

- 5636 RADIOIMMUNOASSAY OF TUMOUR SPECIFIC TRANSPLANTATION ANTIGEN OF A CHEMICALLY INDUCED RAT SARCOMA: CIRCULATING SOLUBLE TUMOUR ANTIGEN IN TUMOUR BEARERS. (E.) Thomson, D. M. P. (Chester Beatty Res. Inst., Sutton, Surrey, England), V. Sellens, S. Eccles and P. Alexander. *Br J Cancer* 28(5):377-388, 1973.

The tumor specific transplantation antigen (TSTA) from a chemically induced rat sarcoma was isolated as an electrophoretically homogeneous soluble material by affinity chromatography using a Sepharose bound antibody raised to the tumor in syngeneic rats. The TSTA is specific for the particular tumor used (the MC-1 sarcoma) and does not cross-react with material

extracted from other rat sarcomas. In addition, a material with different physicochemical properties which cross-reacted with different sarcomas was also eluted from the antibody column; this may be the previously identified onco-embryonic antigen (OEAl) which is immunogenic in the syngeneic host. The purified TSTA labelled with ^{125}I was used in a radioimmunoassay which detected soluble TSTA in rats bearing a MC-1 sarcoma. The assay shows that tumor transplantation is associated with a persisting release of soluble antigen into the circulation. This antigenic burden is present continuously and renewed as long as the tumor mass exists.

- 5637 IMMUNOPOTENTIATION WITH BCG. I. IMMUNE RESPONSE TO DIFFERENT STRAINS AND PREPARATIONS. (E.) Mackaness, G. B. (Trudeau Inst., Saranac Lake, N. Y.), D. J. Auclair and P. H. Lagrange. *J Natl Cancer Inst* 51(5):1655-1667, 1973.

A fully viable inoculum of BCG caused blast transformation and cell proliferation in the regional lymph nodes of specific pathogen-free CD-1 mice without producing any histologic sign of an antibody response. Rates of cell division, measured as the incorporation of tritiated thymidine into DNA, were proportional to the log-dose of viable BCG. Dead organisms and BCG cell walls were immunologically inert but provoked responses when suspended in oil. Cell proliferation in the regional nodes increased for about 14 days and remained elevated for 28 days or more. Mycobacterial species of increasing virulence caused cellular responses of increasing intensity, implying that immunogenicity varies with virulence. By this criterion, BCG strains differ in "virulence" and show corresponding differences in immunogenicity. The Pasteur strain was the most and Glaxo the least immunogenic of the BCG strains tested. Lyophilized commercial vaccines had low viabilities and a high content of soluble antigenic material that provoked brief but intense cellular responses with features characteristic of an antibody formation. The intact BCG in lyophilized vaccines provoked smaller responses than did log-phase cultures. The latter, though inconvenient to store and distribute, gave predictable responses after prolonged storage at -70°C .

- 5638 A MICROTEST RADIOIMMUNOASSAY FOR NONCYTOTOXIC TUMOR-SPECIFIC ANTIBODY TO CELL-SURFACE ANTIGENS. (E.) Goldstein, L. T. (Wistar Inst., Philadelphia, Pa.), N. R. Klinman and L. A. Manson. *J Natl Cancer Inst* 51(5):1713-1715, 1973.

A radioimmunoassay capable of measuring cytolytic and noncytolytic antibodies directed against cell-surface antigens was developed. Cells of the murine lymphoma L-5178Y grown in culture were used as a solid-phase immunoadsorbent to which the antibodies in the sera were bound. These bound antibodies were then detected by reacting the treated cells with a purified ^{125}I -labeled, antimouse-Fab immunoglobulin antibody. Specific antibody was found in a serum from DBA/2J mice (syngeneic host) hyperimmunized against the

L-5178Y tumor. This serum was not cytolytic in a complement-dependent assay. In addition to its sensitivity, this anti-Fab reagent is advantageous because it permits accurate quantitation of antibodies by comparison with standard preparations of purified antibodies specific for chemically defined determinants; it detects mainly light-chain determinants and is therefore equally sensitive to all immunoglobulin classes; and it had little apparent nonspecific binding compared with anti-immunoglobulin reagents thus eliminating the need for using paired label techniques.

- 5639 ANTIEPITHELIAL ANTIBODIES IN THE SERUM OF PATIENTS WITH BENIGN AND MALIGNANT DISEASES OF THE PROSTATE. (E.) Ablin, R. J. (Memorial Hosp., Springfield, Ill.). *Z Immunitaetsforsch* 146(1):8-22, 1973.

Antinuclear antibodies and antibodies reactive with components of stratified squamous epithelium, e.g., intercellular (IC) areas, were observed in the sera of patients with benign prostatic hypertrophy, carcinoma of the prostate, and nonprostatic carcinoma using the method of indirect immunofluorescence. The presence of IC antibodies in pemphigus and other conditions and the coexistence in patients of pemphigus and other autoimmune disorders such as myasthenia gravis and systemic lupus erythematosus indicates that the developing thymus may possess the majority of the so-called accessible "self" antigens of the body to which lymphoid cells with patterns of immunologic reactivity may be exposed prior to their migration from the thymus. If, during postnatal life, there occurred certain diseases of the thymus which were of sufficient magnitude that it altered the milieu of the "self" antigens in the thymus, the result could well be the development of auto-antibodies to those constituents, e.g., IC antibodies in pemphigus. Furthermore, in that IC antibodies may be of considerable diagnostic and prognostic value, the morphology of the IC indirect immunofluorescence staining patterns obtained in relation to the presence of blood group isohemagglutinins and antinuclear antibodies giving rise to false positive or false negative reactions on epithelial tissue is of significance.

- 5640 T AND B LYMPHOCYTES IN HODGKIN'S DISEASE. (E.) Gallmeier, W. M. (U. Clinic Internal Med., GHS Essen, W. Germany), U. Brunsch, R. Pfeiffer, U. Bestek and C. G. Schmidt. *Z Krebsforsch* 80(3):247-254, 1973.

Phytohemagglutinin (PHA) stimulation of peripheral lymphocytes from 54 patients with Hodgkin's disease (H.D.) and 40 normal blood donors was studied as a parameter for T-cell function. Lymphocytes carrying immunoglobulin determinants (B-cells) in the peripheral blood from 67 patients with H.D. and normal blood donors were quantitated by membrane immunofluorescence. PHA stimulation was severely depressed in 48 patients with H.D. as compared to the controls. There was no correlation with clinical stage or histological type. The distribution of B-cells in the

normal blood donors was 33% (S.D. \pm 4) and the mean value in all patients with H.D. was 27% (S.D. \pm 12). No specific pattern of B-cell distribution could be found when the data were analysed for clinical stage (stage I 36.50% \pm 14.47, stage II 26.21% \pm 9.63, stage III 25.77% \pm 12.18, stage IV 25.59% \pm 13.18), histological subtype (lymphocytic predominance 25.84% \pm 13.88, nodular sclerosis 25.58% \pm 11.53, mixed cellularity 29.80% \pm 11.35, lymphocytic depletion 28.00% \pm 13.06) or age. Since no change in the relative distribution of B- and T-cells could be found, it is concluded that the disturbance in cellular immunity in these patients is caused by a functional defect in the T-cells rather than a decrease in their number.

5641 HL-A ANTIGENS AND ACUTE LYMPHOCYTIC LEUKEMIA: THE NATURE OF THE HL-A2 ASSOCIATION.

(E.) Rogentine, G. N. (Natl. Cancer Inst., Bethesda, Md.), R. J. Trapani, R. A. Yankee and E. S. Henderson. *Tissue Antigens* 3(6):470-476, 1973.

Serum HL-A antigens were determined for 85 Caucasian patients with acute lymphocytic leukemia (ALL); the patients' records were also reviewed to determine predisposing factors, clinical and laboratory features at diagnosis, and course of the disease. HL-2A was the only antigen in the ALL group significantly different from a normal control group; it was present in 65% of the ALL patients, as opposed to 44% of the controls. The HL-A antigen frequencies in 53 patients in whom ALL had been diagnosed between 1969 and 1971 were normal, while the frequency of HL-A2 was 84% among 32 patients in whom ALL had been diagnosed between 1962 and 1968. The frequency of HL-A2 in patients surviving 1500 days or more was 83%. The combined frequency of HL-A2, the known related specificity W28, and the possibly related HL-A9 antigen in these long-term survivors was 94%. There were no correlations between HL-A2 frequency and age, geographical area, total white blood cell count, total peripheral blood lymphoblast count, and the percentage of abnormal marrow lymphocytes. HL-A2 frequency did, however, correlate with the total normal peripheral blood lymphocyte count at diagnosis. The data suggest that HL-A2 (and possibly HL-A9 and W28) is not associated with disease susceptibility, but that it confers a form of resistance to ALL.

5642 THE REACTIVITY OF LEUKAEMIC CELLS TO HL-A TYPING SERA. (E.) Evans, C. A. (Charing

Cross Hosp., London, England) and G. D. Pegrum. *Tissue Antigens* 3(6):454-464, 1973.

HL-A typing was performed on cells from 44 patients with leukemia (18 with acute myeloid leukemia (AML), 10 with acute lymphatic leukemia (ALL), and 16 with chronic lymphatic leukemia (CLL)) and on cells from 12 patients with lymphosarcoma. In ALL, the typing patterns were usually unequivocal, whereas in CLL it was more usual to find the true HL-A profile obscured by many extra reactions. The lymphosarcomas were evenly divided between clear cut patterns and those involving extras. The patients with AML showed many extra antigens, with a high proportion

of apparent changes in the HL-A pattern. All types of leukemia studied showed occasional positive reactions to antiserum Reid in the absence of HL-A10 antigen, although none so markedly as the CLL groups; this group always gave positive reactions to Reid.

5643 EFFECT OF HOST IMMUNITY ON THE ANTIGENIC STRENGTH OF PRIMARY TUMORS. (E.) Bartlett,

G. L. (Inst. Cancer Res., Philadelphia, Pa.). *J Natl Cancer Inst* 49(2):493-504, 1973.

Sarcomas induced by 3-methylcholanthrene (MCA) implanted s.c. into mice showed varying latent periods (LP). Further, tumors appearing at any given LP showed varying antigenic strengths (Ag). However, tumors having high Ag tended to correlate with those having low LP and to be rare among those having high LP. Similar results were obtained with young and old mice, indicating that the decline of Ag with LP was not solely a function of age of host at time of appearance of tumor. Tumors with short LP tended to show a higher growth rate (GR) than those with long LP. However, an expected direct relationship between GR and Ag was not statistically significant, rendering it unlikely that tumor antigenicity resulting from alteration of cell-surface growth regulatory sites provides the sole mechanism for the observed inverse relation between LP and Ag. Tumors induced by the action of MCA on cultures of connective tissue within diffusion chambers, and thus under conditions of protection against host immunity, showed no relationship between LP and Ag. This indicated that the inverse relationship observed between LP and Ag under conditions of exposure to host immunity was largely due to immunoselection. Tumors appeared spontaneously but with low frequency in cultures of connective tissue in diffusion chambers in the absence of MCA. Such tumors were not detectably antigenic. It was suggested that, because of the low antigenicity of tumors induced in the absence of host immune forces and of many tumors appearing at short latent periods, immunoselection was not a major determinant of low antigenicity, and it was concluded that such tumors lacked strong tumor-specific transplantation antigens at their inception. It was also suggested that because of lack of antigenicity, spontaneous tumors may not be amenable to effective immunosurveillance.

5644 IMMUNOPOTENTIATION WITH BCG. III. MODULATION OF THE RESPONSE TO A TUMOR-SPECIFIC ANTIGEN. (E.) Hawrylko, E. (Trudeau Inst., Saranac

Lake, N.Y.) and G. B. Mackaness. *J Natl Cancer Inst* 51(5):1677-1682, 1973.

A mouse model was developed to study the effect of BCG on the induction of systemic immunity to the DBA/2 mastocytoma, P815 (MA), in (C57BL/6 X DBA/2) F_1 female mice. Two conventional tests, implantation and subsequent excision of living tumor cells and immunization with irradiated tumor cells, showed that the MA had no detectable immunogenicity. However, a small inoculum grew in the footpad for a limited period and then regressed. This incipient immunogenicity was more apparent when a varying

number of BCG was added to the tumor inoculum; the survivors, however, were not uniformly immune to challenge. When irradiated MA cells were injected into sites prepared by a prior injection of BCG, a varying degree of immunity developed against a large tumor challenge (10^6 MA) at a distant site in the footpad. Resistance was not discernibly increased by BCG or irradiated MA alone, but the combined stimulus suppressed a tumor challenge in all mice for 10 days. Tumors subsequently "escaped" over a period of 50 days in 5 of 6 mice; but 5 of 6 tumor-free survivors from other experiments were resistant to 10^6 MA when challenged after 100 days.

- 5645 THE ROLE OF LYSOSOMES IN LYMPHOCYTE TRANSFORMATION *IN VITRO*. (E.) Tchorzewski, H. (Military Med. Sch., Lodz, Poland). *Arch Immunol Ther Exp (Warsz)* 20(6):831-835, 1972.

The effects of Zymophren (an analogue of trasyolol) on the blastic transformation of spleen node lymphocytes *in vitro* and on oxygen consumption were studied using normal guinea pigs and albumin-sensitized animals given positive skin tests with passive hemagglutination antibody titers between 1:2064 and 1:4128. The percentages of blast cells after stimulation with the antigen were somewhat higher than those following stimulation with phytohemagglutinin (PHA). Lysosomal granules were isolated from peritoneal exudate cells composed of 85-95% granulocytes, 2-8% lymphocytes, and 0-7% monocytes. Following thermal inactivation, these samples showed no enzyme activity. The influence of lysosomal proteins on the blastic transformation of lymphocytes *in vitro* was studied. The data indicate that the lysosomal proteins of allogeneic neutrophilic granulocytes stimulate the blastic transformation of lymphocytes. The lymphocyte-transforming factor is partially inactivated at 56 C and is species-specific; this factor probably increases antibody production by lymphocytes from sensitized animals.

- 5646 EVALUATION OF CELL-MEDIATED CYTOTOXIC REACTIVITY AGAINST TUMOR ASSOCIATED ANTIGENS WITH 125 I-IODODEOXYURIDINE LABELED TARGET CELLS. (E.) Oldham, R. K. (Natl. Cancer Inst., Bethesda, Md.) and R. B. Herberman. *J Immunol* 111(6):1863-1871, 1973.

An *in vitro* lymphocyte cytotoxicity tissue culture assay utilizing 125 I-iododeoxyuridine (125 IUDR) labeled target cells is described. The assay is a technically simple, reproducible test in which the isotope is incorporated exclusively into target cell DNA. The incorporated isotope is then released only with cell death and lysis, the amount of isotope released into the supernatant during incubation constituting an accurate reflection of cell death. This assay measures cytotoxicity as opposed to many other assays which measure, in addition to cytotoxicity, growth inhibition, loss of adherence, and membrane damage without cell lysis. Only the lysis of existing prelabeled cells is measured. The use of trypsin to increase the sensitivity of the

assay appeared unnecessary. The assay has proven useful in detecting tumor associated antigens in both animal (syngeneic rat) and human tumor cell systems.

- 5647 IMMUNITY TO DNA-VIRUS-ASSOCIATED ANTIGENS IN A HUMAN TUMOR (BURKITT'S LYMPHOMA). (Ger.) Gunven, P. (Inst. Tumor Biol., Karolinska Inst., Stockholm, Sweden). *Zentralbl Bakteriol (Orig)* 220:52-56, 1972.

A review is presented of changes occurring in antibodies to DNA-virus-associated antigens during the course of Burkitt's lymphoma. The effects of chemotherapy and immunotherapy with BCG and pertussis vaccine are considered. Unpublished results obtained on one of the author's patients suggests that anti-membrane antigen antibodies could be "enhancing antibodies" which facilitate tumor growth. However, this is unlikely since the titer of these antibodies increased during BCG therapy without a recurrence developing. Conventional anti-membrane antigen titers show that antibodies are present for only two of the three components of surface antigens associated with Epstein-Barr virus. No changes were found in antibodies against the third component, either before or during recurrence. It is hoped that serological studies will aid in improving results obtained with BCG therapy. (10 references)

- 5648 SURFACE IMMUNOGLOBULIN OF MYELOMA CELLS. (E.) Bevan, M. J. (Natl. Inst. Med. Res., London, England). *Eur J Immunol* 3(8):502-506, 1973.

Using fluorescein-labeled rabbit anti-mouse immunoglobulin sera (F-RAMIG) or unlabeled RAMIG and fluorescein-labeled goat anti-rabbit immunoglobulin sera (F-GARIG), the H- and L-chain specificity of the surface reactive immunoglobulin (Ig) of myeloma tumors was studied. The patterns of labeling at 0 C and at room temperature were compared and the redistribution of the surface Ig after complexing with RAMIG was studied. Tissue culture adapted murine myeloma cells 5563 (IgG_{2a}κ) were used most extensively in these studies. 95-100% of the cells show surface fluorescence at both temperatures after staining with F-RAMIG or with RAMIG followed by F-GARIG. At 0 C the staining is diffuse over all the surface, at room temperature the staining is much brighter and patchy. The nature of the H and L-chains at the surface of the myeloma cell is shown to parallel the type of secretory product. Thus, 5563 cells stain brilliantly with anti-IgG and anti-κ chain sera, but not at all with anti-μ or anti-α chain sera, which respectively stain TEPC 183 (IgMκ) and MOPC 47A (IgAκ) cells brilliantly. Also, MOPC 315 cells (IgAλ) do not stain with antisera against 5563 myeloma protein, but do stain with antisera against MOPC 47A and MOPC 104E myeloma proteins. Immediately after staining at 0 C or room temperature, the fluorescence is located over the whole surface. However, if the stained cells are incubated at 37 C in tissue culture medium, the stain gradually localizes

to one pole of the cell such that by 5 hr., about 50% of the cells show staining localized to one hemisphere. The presence of the RAMIG-antigen complex seemed to have little or no effect on the rate of secretion of myeloma protein during a 5 hr. period. The results are discussed in relation of the findings of others and to the significance of the surface immunoglobulin of myeloma cells.

- 5649 IMMUNO-ELECTRON MICROSCOPIC STUDIES ON SURFACE ANTIGENS OF RAT TUMOR CELLS INFECTED WITH FRIEND VIRUS. (E.) Kodama, T. (Hoddaido U. Sch. Med., Japan), E. Gotohda and H. Kobayashi. *Gann* 64(5):475-479, 1973.

The occurrence and topography of the following surface antigens on the cells of virus-infected tumors in the rat were investigated by immuno-electron microscopy using an indirect method with ferritin-labeled antibody: the histocompatibility antigen of rats (R^w) and tumor-specific surface antigen (TSSA) on the cells of Friend virus infected FV-KMT-17 or noninfected (KMT-17) tumor cells in rats; and virus-induced specific surface antigen (VSSA) and virus antigen on FV-KMT-17 cells. R^w and TSSA were present on the FV-KMT-17 and KMT-17 cell surfaces, with similar ferritin labeling patterns. VSSA and virus antigen were also found on the FV-KMT-17 cells. However, R^w , TSSA, and VSSA were absent from the surfaces of type-C Friend virus particles produced from FV-KMT-17 cells. The data suggest that the acquisition of virus antigen and VSSA by virus-infected FV-KMT-17 cells, as compared with noninfected KMT-17 cells, is essential to the xenogenization of the tumor (artificial regression of the tumor via virus infection).

- 5650 CHARACTERIZATION OF A SECOND NORMAL ANTIGEN THAT CROSS-REACTS WITH CEA. (E.) Burtin, P. (Inst. Scientific Cancer Res., Villejuif, France), G. Chavanel and H. Hirsch-Marie. *J Immunol* 111(6):1926-1928, 1973.

Perchloric extracts of normal gastric mucosa, normal lung, gastric and colonic tumors, normal human plasma, stools, and meconium were tested for reactivity with a sheep antiserum (B 11) immunized with purified carcinoembryonic antigen (CEA) and several rabbit anti-CEA antisera. An apparently new antigen, found in several stool and meconium extracts, was found to cross-react with CEA; it was labelled non-specific cross-reacting antigen 2 (NCA 2). Immunodiffusion showed the presence of NCA 2 in the extracts of digestive tissues; preliminary immunofluorescence studies localized it in the cytoplasm and on the intercellular walls. Doubtful results were obtained with the plasma perchloric extracts. Its presence in meconium and in the intercellular walls of the gastric and colonic mucosa, plus the fact that it spurred over CEA with anti-NCA 2 antisera (showing that it contained an antigenic determinant not present on CEA), indicated that NCA 2 is not a degradation product of CEA. NCA 2 is probably a glycoprotein having a molecular wt of 60,000 daltons. This makes it similar to NCA, whose antigenic reactivity is quite different.

- 5651 IMMUNOPOTENTIATION WITH BCG. IV. FACTORS AFFECTING THE MAGNITUDE OF AN ANTITUMOR RESPONSE. (E.) Hawrylko, E. (Trudeau Inst., Saranac Lake, N. Y.) and G. B. Mackaness. *J Natl Cancer Inst* 51(5):1683-1688, 1973.

The immunopotentiating activity of BCG was studied in a test system that measured the capacity of irradiated murine tumor cells (mastocytoma, P815) to provoke systemic immunity when injected into sites prepared by the prior injection of ECG; a tumor located remotely in the footpad was monitored for evidence of specific resistance. The test animals were female B6D2F1 mice. The first sign of tumor inhibition occurred 7 days after the tumor-specific immunogenic stimulus was introduced, and maximum tumor immunity was achieved when the irradiated tumor cells were injected 10 days after the priming dose of BCG; complete protection was never obtained. The frequency of tumor suppression and the overall survival rates were increased by raising the priming dose of BCG, although raising the dose of irradiated tumor cells beyond 10,000,000 cells caused less suppression and lower survival rates. A significant level of antitumor immunity developed only when irradiated tumor cells were injected into BCG-infected sites; neither BCG or irradiated cells alone had any significant tumor-suppressive effect.

- 5652 SERUM PROPERDINE CONCENTRATION IN PATIENTS WITH TUMORS AND INFLAMMATORY DISEASES OF THE BRAIN. (E.) Grinberg, S. A. (Kazan Sci. Res. Inst. Traumatol. Orthopedics, USSR). *Zh Nevropatol Psikiat* 72(6):857-858, 1972.

Serum properdine concentrations were determined in 56 patients with brain tumors, 46 patients with inflammatory diseases of the brain simulating tumors, and 10 normal controls. Mean serum properdine concentrations were 12.2 $\mu\text{g/ml}$ for patients with brain tumors, 15.9 $\mu\text{g/ml}$ for patients with inflammatory brain diseases and 29 $\mu\text{g/ml}$ for controls. Decreases in properdine concentrations were highly significant for both groups of patients and are an indication of their decreased immunity. Because properdine concentrations tended to be lowest in patients with advanced brain tumors (as low as 2.8 $\mu\text{g/ml}$), they may be of some value in diagnosis and prognosis.

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- 5733 SKIN TEST IN BRONCHOGENIC CARCINOMA: II. ITS VALUE IN THE DIFFERENTIAL DIAGNOSIS. (E.) Brugarolas, A. (Roswell Park Mem. Inst., Buffalo, N.Y.), H. Takita and R. G. Vincent. *J Surg Oncol* 5(4):319-325, 1973.

- 5734 EXTRACTION OF PEMPHIGUS ANTIBODIES FROM A LYMPHOID NEOPLASM AND ITS POSSIBLE RELATIONSHIP TO PEMPHIGUS VULGARIS. (E.) Saikia, N. K. (Western Infirmary, Glasgow, Scotland). *Br J Dermatol* 86(4):411-414, 1972.
- 5735 GROWTH RATE OF AN ALLOGENEIC MOUSE TUMOUR IN ANTIGENICALLY PRETREATED HOSTS AS A FUNCTION OF THE DOSE OF CELL-FREE H-2 ANTIGENS USED. (E.) Hilgert, I. (Inst. Exp. Biol. Genetics, Czechoslovak Acad. Sci., Prague). *Folia Biol (Praha)* 18(3):176-180, 1972.
- 5736 FAILURE OF *BACILLUS CALMETTE-GUERIN* (BCG) INFECTION TO SUPPRESS THE GROWTH OF TRANSPLANTED MOUSE AND RAT SARCOMAS. (E.) Simova, J. (Inst. Experimental Biol., Genetics, Czechoslovak Acad. Sci., Prague) and J. Bubenik. *Folia Biol (Praha)* 19(4):296-300, 1973.
- 5737 RELATIONSHIP OF C-REACTIVE PROTEIN IN AUTOLOGOUS PLASMA OF CANCER PATIENTS AND CHOLINE PHOSPHATE IN LYMPHOCYTE RESPONSES TO PHYTOHEMAGGLUTININ. (E.) Oishi, N. (Sch. Med., U. Hawaii, Honolulu), C. Torikawa, H. Ochiai and Y. Hokama. *J Reticuloendothel Soc* 14(3):242-249, 1973.

See also:

- * (Rev): 5406, 5408, 5412, 5414, 5416
- * (Viral): 5563, 5571, 5575, 5577, 5579, 5581, 5584, 5594

- 5738 HORMONAL REGULATION OF RAPIDLY LABELED RNA IN NORMAL PRENEOPLASTIC AND NEOPLASTIC TISSUES OF MOUSE MAMMARY GLAND. (E.) Banerjee, D. N. (Dept. Zool., U. Nebraska, Lincoln), M. R. Banerjee and R. G. Mehta. *J Natl Cancer Inst* 51(3):843-849, 1973.

Linear sucrose-density gradient and polyacrylamide-gel electrophoresis were used to analyze patterns of rapidly labeled RNA synthesis in normal, preneoplastic, and neoplastic tissues of BALB/c mouse mammary gland. As measured by 5-³H-uridine incorporation, there was no synthesis of rapidly labeled, high molecular weight RNA in the mammary tissue of young virgin mice. Administration of estradiol-17 β plus progesterone 1 mg s.c. to intact or ovariectomized or adrenalectomized virgins induced a sharp rise of rapidly labeled RNA synthesis with patterns like those of the mammary tissue of pregnancy. The growth-promoting actions of the ovarian hormones in the mammary tissue thus appeared to involve induction of rapidly labeled, polydispersed RNA. The preneoplastic nodule outgrowth lines D1 and D8, carried in virgin hosts, actively synthesized rapidly labeled, high molecular weight RNA regardless of tumorigenic potential. RNA labeled with H-methyl-methionine showed that newly made RNA included both ribosomal precursor RNA and heterogeneous nuclear RNA. Ovariectomy and adrenalectomy or extended treatment with estradiol-17 β plus progesterone failed to alter the patterns of rapidly labeled RNA synthesis in the preneoplastic tissues. A similar unaltered pattern of RNA synthesis was evident when the nodule tissue was carried in pregnant or lactating hosts. Therefore, RNA synthesis in nodule cells remained unresponsive to the ovarian hormonal regulation. Rapidly labeled RNA synthesis in the mammary tumors derived from these precancerous tissues showed a similar unresponsiveness to hormonal control; thus altered responsiveness to host hormonal control of preneoplastic nodule RNA may not be the ultimate metabolic abnormality leading to neoplastic transformation.

- 5739 THE ROLE OF SOME FACTORS IN THE INDUCTION AND DEVELOPMENT OF LIP CANCER. (Rus.) Ryzvanov, A. A. (S. V. Kurashov Med. Inst., Kazan, USSR). *Kazan Med Zh* (5):20-31, 1973.

Histological and histochemical examinations were made of lip biopsies from 85 patients (70 men and 15 women) with precancerous conditions of the lip. The beginnings of malignant growth were detected in 25 of these patients. These consisted of 2 with leukoplakia, 13 with hyperkeratosis, 5 with chronic cheilitis, 3 with papillomas and 2 with keratoacanthomas. Biopsies from all of these patients showed epithelial proliferation, the disappearance of glycogen, and an increase in the nucleic acid content. Atypical cells were found among the proliferating epithelial cells, and basal membranes were destroyed at sites of infiltrative growth. The underlying stroma contained plasmacyte infiltrates associated with some fibroblasts containing large amounts of RNA, fat and lymphoid cells, and large numbers of newly formed blood vessels. Elastic fibers had

completely disappeared, and the staining properties of collagen fibers had changed. An increase in the acid mucopolysaccharide content was accompanied by a decrease in neutral mucopolysaccharides. Alkaline phosphatase activity was high in the walls of blood vessels. The author considers that lymphoid and plasma cell infiltrates in the stroma are a manifestation of a local immune reaction which is a response to antigenic changes in tissue proteins during carcinogenesis. It is not inflammation alone, but inflammation combined with dystrophic changes in the tissues and disturbances in cell differentiation and fiber structure, which plays an important role in carcinogenesis.

- 5740 MUCOSAL HYPERPLASIA, MUCINOUS CYSTADENOMA, AND MUCINOUS CYSTADENOCARCINOMA OF THE APPENDIX. A RE-EVALUATION OF APPENDICEAL "MUCOCELE" (E.) Higa, E. (Barnes Hosp., St. Louis, Mo.), J. Rosai, C. A. Pizzimbono and L. Wise. *Cancer* 32(6):1525-1541, 1973.

- 5741 CLINICO-ENDOSCOPIC AND MORPHOLOGICAL PARALLELS IN DIAGNOSIS OF PRETUMOR DISEASES AND INITIAL FORMS OF THE CERVICAL CANCER. (Rus.) Garmanova, N. V. (Petrov Res. Inst. Oncol., Leningrad, USSR). *Vopr Oncol* 19(10):61-68, 1973.

- 5742 EPITHELIAL TUMORS OF THE SALIVARY GLANDS CONTAINING LYMPHATIC TISSUE. III. REMARKS ON THE PATHOGENESIS OF LYMPHOEPITHELIAL TUMORS OF THE SALIVARY GLANDS. (Pol.) Sikorowa, L. (Inst. Oncol., Warsaw, Poland). *Patol Pol* 24(1):45-56, 1973.

- 5743 BASAL CELL CARCINOMA ORIGINATING IN A BENIGN CYSTIC TERATOMA OF THE OVARY. (E.) Mathios, A. J. (Dept. Path. U. California, San Francisco) and A. M. McCausland. *Obstet Gynecol* 42(6):892-896, 1973.

- 5744 ASSOCIATION BETWEEN MIXED TUMORS AND EPITHELIOMAS OF THE PAROTID: 23 CASES. (Fr.) Micheau, C. (Gustave Roussy Inst., Villejuif, France), J. Lacour and R. Gerard-Marchant. *Arch Anat Pathol (Paris)* 21(3):251-260, 1973.

- 5745 HISTOCHEMICAL CHANGES IN THE EPITHELIUM AND UNDERLYING CONNECTIVE TISSUE IN PRECANCEROUS CONDITIONS AND THE INITIAL STAGES OF CERVICAL CANCER. (Rus.) Mavliutova, Z. V. (No affiliation). *Kazan Med Zh* (5):69-70, 1973.

- 5746 LOCALIZATION OF PRECANCEROUS CELLS IN
 CANCER INDUCED BY PLASTICS. (Rus.)
Moizhess, T. G. (Inst. Exp. Clin. Oncol., Moscow,
USSR) and E. L. Prigozhina. *Biull Eksp Biol Med*
79(9):92-94, 1973.

See also:

- * (Chem): 5431, 5520
- * (Epid-Biom): 5761

- 5747 RADIONUCLIDE STUDIES ON THE GROWTH OF INTRAHEPATIC TUMORS AND OF THE INFILTRATED LIVER. (E.) Spencer, R. P. (Yale U. Sch. Med., New Haven, Conn.) and J. T. Witek. *Cancer* 32(4): 838-842, 1973.

It is suggested that radionuclide scans of the liver can be used to measure the rate of growth of intrahepatic neoplasms. Techniques for accomplishing this are discussed, and the linear growth rate (change in diameter/time) is calculated. In five cases of metastatic tumors to the liver, the linear growth rate ranged from 100×10^{-3} to 400×10^{-3} mm/day (from 43 to 694 days). To compare single intrahepatic tumors with those which infiltrate the liver, estimates of tumor and hepatic wt are needed. In two cases of diffuse hepatic involvement (carcinoma of stomach, acute lymphatic leukemia) the estimated change in hepatic wt/day is 1.6 and 30.5 grams, resp. This technique may be useful for showing the time course of hepatic involvement, comparing the growth of hepatic and pulmonary lesions before and after therapy, and comparing the observed rates with various growth hypotheses.

- 5748 EPIDEMIOLOGY OF BREAST CANCER. (Rus.) Saprykina, A. G. (D. I. Ul'ianov Med. Inst., Kuibyshev, USSR). *Kazan Med Zh* (5):21-23, 1973.

In 1966-1967, breast cancer was the fourth most common form of cancer in women in the USSR and accounted for 9% of all cancer in women but for only 0.1% of all cancer in men. In the Kuibyshev district, the age-standardized prevalence of breast cancer increased from 12.5/100,000 in 1959 to 19.9/100,000 in 1971. This increase occurred in both urban and rural populations, but was more pronounced in urban areas. This may be due to factors affecting the hormonal status of the female population (decrease in the birth rate, increase in the number of abortions, decrease in the lactation period, development of the chemical industry). The prevalence of breast cancer has increased in all age groups, but particularly among women aged 40-49 yr and those 70 yr old or older. The highest prevalence for breast cancer for the entire period was among women aged 50-59 yr. Age curves for the prevalence of breast cancer were almost identical for urban and rural populations, but the prevalence of breast cancer was lower in rural populations for all age groups. The prevalence of breast cancer was significantly higher in urban than in rural areas. The highest prevalence of breast cancer was noted in towns with petrochemical and petroleum refining plants and plants producing construction materials. Computer analysis of medical records of 414 women with breast cancer and 580 age-matched normal controls revealed that the following factors were associated with a significantly increased risk of developing breast cancer: (1) onset of menstruation at age 17 or later, (2) beginning of sexual relations at age 30 or later, (3) a brief or unregulated sex life, (4) frigidity, and (5) decreased libido. Breast cancer also appears to be closely

associated with giving birth for the first time at age 26 or later, sterility, a small number of children, little or no lactation, multiple abortions, and breast disease. Histories of neoplasms, particularly breast cancer, in blood relatives on the mother's side of the family are associated with an increased risk of developing breast cancer.

- 5749 UNUSUAL COMPARATIVE FREQUENCY OF GASTRIC CARCINOMA, PERNICIOUS ANEMIA, AND PEPTIC ULCER IN SOUTHWESTERN AMERICAN INDIANS. (E.) Sievers, M. L. (Phoenix Indian Med. Ctr., Ariz.). *Gastroenterology* 65(6):867-876, 1973.

The prevalence of gastric carcinoma, pernicious anemia (PA), gastric ulcer, and duodenal ulcer (DU) among patients at the Phoenix Indian Medical Center was studied. Over 17 years, there were 129 patients with these four diseases. In comparison with rates for the general population, the southwestern Indians approximated the expected numbers of gastric carcinoma and PA, but had marked deficits for gastric ulcer and DU. All with gastric carcinoma, PA, or gastric ulcer were Indian, but 26% of the 19 with DU were non-Indian, although the non-Indian hospital admission rate was only 0.5%. Almost one-third of the 41 Indians with peptic ulcer had only partial Indian heritage, and 9 of those 13 had DU. Among full-blooded southwestern Indians, who comprised 90% of hospital admissions, 60 had gastric carcinoma; 18, PA; 22, gastric ulcer; and 3, DU. In contrast with reported Caucasian experience, gastric lesions of Indians were much more likely (2.7:1.0) to be malignant than benign, this probability being highest (8.4:1.0) for the Hohokam (Pima-Papago). Except for a vast predominance of blood group O, the southwestern Indians had attributes generally compatible with the observed infrequency of peptic ulcer and moderate prevalence of gastric carcinoma and PA: rural reservation residence; lower socioeconomic level; noncompetitiveness; obesity; ABH salivary secretion; phenothiocarbamide taste sensitivity; high rates of diabetes mellitus and cholelithiasis; excessive drinking of alcohol; infrequent smoking of cigarettes; and low rates for chronic obstructive lung disease and coronary heart disease. Detailed gastric secretory studies and observation of future disease patterns in southwestern Indians may increase the understanding of these disorders.

- 5750 STATISTICAL STUDY ON MELANOMA IN JAPAN (1961-1970). (E.) Seiji, M. (Tohoku U. Sch. Med., Sendai, Japan) and T. Ohsumi. *Asian Med J* 16(2):33-44, 1973.

A statistical study was made of 501 cases of malignant melanoma in Japan between 1961 and 1970. Malignant melanoma is still found less often among Japanese than in white racial groups but its incidence indicates a definite upward trend in recent years. The incidence of malignant melanoma is slightly higher in males than in females. The distribution of this disease by age presents no significant difference by sex and there are two high incidence peaks in the third and sixth decade of life. The

most frequent sites of involvement are the skin (28.5%), mucous membrane (27.0%), and eye (23.9%). With skin lesions, the most common primary site is the lower extremities, especially the sole of the foot. Among the mucous lesions, the mouth is the most common site of involvement. The relationship between the onset of malignant melanoma and the number of melanocytes in different parts of the body was studied in 64 patients. There seems to be a parallel relationship between the incidence of melanoma and the number of melanocytes per unit skin area. An exceptionally high incidence of melanoma was observed on the sole. The incidence of metastasis appears to be higher in the older age group than in the younger. There were high incidences of metastasis to the trunk, lower limbs, and gastrointestinal tract. Fifty-five patients (63%) gave a history of preexisting pigmented lesions at the site of the primary melanoma.

- 5751 FIBRE AND CANCER OF THE COLON. (E.)
Irving, D. (London Sch. Hyg., England)
and B. S. Drasar. *Br J Cancer* 28(5):462-463, 1973.

A comparison was made between the amount of individual fiber containing foods available for consumption per day per person in 38 countries and the incidence of colon cancer in these countries. The foods considered as sources of fiber were cereals; potatoes and other starch foods; pulses, nuts and seeds; vegetables; and fruits. The only statistically significant correlation coefficient resulting from the comparison showed a negative association, -0.30, between the incidence of colon cancer and the intake of cereals. The correlation coefficient of the various foods viewed as one total group of fiber source was not significant.

- 5752 ESOPHAGEAL CANCER ON THE CASPIAN LITTORAL.
(E.) Anonymous. *Lancet* 7842:1365-1370,
1973.

There are three principal geographic areas with a very high incidence of esophageal cancer: certain eastern and southern regions of sub-Saharan Africa; Curacao and parts of Brazil; and central Asia. The third region encompasses the Caspian littoral, which is characterized by high incidence rates of esophageal cancer in the east and northeast, low incidence rates in the southwest, and intermediate incidence rates in the southeastern and central regions. The sparsely populated high incidence regions in the east have very little rain and consist largely of low-lying steppe and desert; the soil is strongly saline and agriculture, where possible, consists of dry farming. The more densely populated low incidence zone in the southwestern littoral lies within the Caspian rain-belt and supports many dense forests; the nonsaline soil supports extensive wet farming. The 1966 national census of Iran confirmed the wide regional variations in the incidence of esophageal cancer; comparable regional variations in the incidence of other tumors were not found in men and women aged between 35 and 64. The incidence of esophageal cancer appeared to be more or less equal

in both sexes. Although the disease is not confined to any one ethnic group, its incidence is much higher among certain groups (e.g., the Kazakh tribesmen living in the Ghuryev area) than among other groups (e.g., the Russians living in the Ghuryev) living in the same area. With regard to etiology, environmental rather than genetic factors are strongly indicated. Neither alcohol nor tobacco seem likely factors, and neither exogenous nor naturally occurring carcinogens have been recognized. Thus, the etiology is probably related to the interlocking features of soil, crops, and diet, particularly as regards potential dietary deficiencies.

- 5753 BURKITT'S LYMPHOMA IN THE NORTH MARA DISTRICT OF TANZANIA 1964-70: FAILURE TO FIND EVIDENCE OF TIME-SPACE CLUSTERING IN A HIGH RISK ISOLATED RURAL AREA. (E.) Brubaker, G. (Shirati Mission Hosp., Tarime, N. Mara, Tanzania), A. Geser and M. C. Pike. *Br J Cancer* 28(5):469-472, 1973.

Thirty-nine cases of Burkitt's lymphoma were identified among the residents of North Mara, Tanzania during the period 1964 through 1970. North Mara is an isolated, virtually completely rural area on the shores of Lake Victoria with malaria transmission occurring throughout the year. North Mara is a high incidence area for Burkitt's lymphoma. The Burkitt's lymphoma cases identified in this study were tested for space-time clustering in terms of dates of onset and dates of diagnosis. None of the results approached statistical significance. Thus, the clustering of Burkitt's lymphoma cases is not universal, with these data casting some doubt on the validity of previously reported clustering in the West Nile and Bwamba regions.

- 5754 RENAL CARCINOMA AND COFFEE CONSUMPTION IN 16 COUNTRIES. (E.) Shennan, D. H. (Ministry Hlth., Barbados). *Br J Cancer* 28(5):473-474, 1973.

Pairing of mortality data from renal carcinoma and coffee consumption per capita in 16 countries resulted in a correlation coefficient of 0.79. However, in many cases a pairing of the two items for individual countries did not show a high correlation between them. It is suggested that coffee consumption may play a part, along with numerous other environmental influences, in the etiology of renal carcinoma. It is further suggested that other diuretic agents, including drugs, may play a similar role.

- 5755 EPIDEMIOLOGY OF LEUKEMIA IN CHILDREN: A 20-YEAR STUDY OF THE AREA SERVED BY THE PEDIATRIC CLINIC, UNIVERSITY OF ROSTOCK. (Ger.) Blau, H. -J. (Pediatr. Clin., U. Rostock, Germany). *Wiss Z Univ Rostock Math Naturwissenschaftl* 21(5):437-448, 1972.

An analysis was made of the histories of 152 children (87 boys and 65 girls, aged from birth to 13.5 yr) with leukemia and of 100 controls (27 boys and 73 girls, aged 1 month to 14 yr) with pyelonephritis. Children with leukemia had lymphoblastic leukemia

(125 cases), acute myeloid leukemia (19 cases), or chronic myeloid leukemia (8 cases). Only 8 of the 152 children with leukemia had a history of direct contact with persons or animals who had malignancies. No evidence of "clusters" were found which could be accounted for by the high incidence of leukemia among dairy cattle in the Rostock area. Although 11 of the mothers of these children had illnesses during pregnancy, no clear correlation could be established with subsequent development of leukemia in the children. None of the mothers of children with leukemia or of controls had been exposed to large amounts of radiation during pregnancy. Infections with high fevers preceded the diagnosis of leukemia by several weeks in 26 children. These included "influenza" (15 cases), pneumonia (3), trench mouth (3), and measles, chickenpox, sore throat, otitis media, and typhoid fever in one case each. As long as one yr before onset of leukemia, panmyelopathies or bone marrow aplasia had been diagnosed in 5 children, agranulocytosis in one, and eosinophilia in one. Improvements occurred in two children after intercurrent infections and blood transfusions. During subacute leukemia the tuberculin reaction was negative in a larger percentage of children with leukemia than in controls. Tuberculosis was diagnosed at autopsy in only one case. An analysis of endogenous factors demonstrated that there was an increased incidence of malignancies among the families of children with leukemia. Histories of malignancies were found for 34 relatives of the 152 children with leukemia; 12 of these malignancies were neoplastic blood diseases. Only 3 relatives of the 100 controls had malignancies. Leukemia was associated with Down's syndrome in 2 cases. The age of mothers at the birth of children who later developed leukemia was greater (28 yr) than that of control mothers (26 yr).

- 5756 PARALLEL MORBIDITY AGE-CURVES FOR NEOPLASMS OF THE LUNG AND BLADDER. (E.) Clemmesen, J. (Danish Cancer Registry, Finsen Inst., Copenhagen) and V. Bremerskov. *Biomedicine* 19(5): 198-199, 1973.

Morbidity age curves for neoplasms of the lung and bladder among males living in metropolitan Copenhagen were constructed using data from the Danish Cancer Registry for the years 1943 through 1967. The age curves for the two neoplasms were nearly parallel, with a correlation coefficient of .97. The age curve for bladder tumors was, however, placed later in life than that for lung cancer, indicating a latent period of 9 to 10 yr longer with the former. In that previous data have shown that tobacco smoking is associated with bladder tumors among Copenhagen males, there is reason to assume a simultaneous oncogenic influence on both lung and urinary bladder.

- 5757 OBSERVATIONS ON TWO TRANSPLANTED TUMOURS GROWING SYNCHRONOUSLY IN MICE. (E.) Theologides, A. (U. Minnesota Sch. Med., Minneapolis). *Vth Perugia Quadrennial Intl Conference on Cancer* 66, 1973.

- 5758 MULTIPLE PRIMARY TUMORS, A TWENTY YEAR FOLLOW-UP OF 658 PATIENTS WITH COLO-RECTAL CANCER. Khafagy, M. (Mem. Sloan Kettering Cancer Ctr., New York, N.Y.) and H. W. Whiteley. *Vth Perugia Quadrennial Intl Conference on Cancer* 54, 1973.

- 5759 MULTIPLE PRIMARY MALIGNANT NEOPLASMS: A COMPARISON OF THE RATE OF OCCURRENCE IN CAUCASIANS, CAUCASIAN-SPANISH AMERICANS AND AMERICAN INDIANS. (E.) Bordin, G. M. (U. New Mexico Med. Sch., Albuquerque). *Vth Perugia Quadrennial Intl on Cancer* 22, 1973.

- 5760 FREQUENCY OF MULTIPLE PRIMARY MALIGNANT TUMORS IN THE LAST THREE YEARS AT THE CENTRAL INSTITUTE FOR TUMORS AND ALLIED DISEASES, ZAGREB. (E.) Kolaric, K. (Central Inst. Tumors, Allied Diseases, Zagreb, Yugoslavia), B. Popovic, Z. Maricic and P. Nola. *Vth Perugia Quadrennial Intl on Cancer* 15, 1973.

- 5761 INCIDENCE OF MULTIPLE PRIMARY MALIGNANCY AND ITS ASSOCIATION WITH BENIGN AND PRE-CANCEROUS LESIONS — BASED ON EXPERIENCE AT A COMMUNITY HOSPITAL. (E.) Lahiri, S. R. (Wesson Mem. Hosp., Springfield, Mass.) and M. Wiemann. *Vth Perugia Quadrennial Intl Conference on Cancer* 13, 1973.

- 5762 INCIDENCE OF MULTIPLE PRIMARY CANCERS IN THE EXPERIENCE OF A TEXAS POPULATION OF FIVE MILLION FOR 25 YEARS. (E.) MacDonald, E. J. (Med. Ctr., Texas U., Houston). *Vth Perugia Quadrennial Intl Conference on Cancer* 12, 1973.

- 5763 INCIDENCE OF PRIMARY MALIGNANT TUMOURS IN PIEMONTE AND THE VALLE D'AOSTA. (It.) Anglesio, E. (Piemonte, Valle d'Aosta Tumor Registry, Turin, Italy) and P. M. Cappa. *Vth Perugia Quadrennial Conference on Cancer* 11, 1973.

- 5764 INCIDENCE OF MULTIPLE MALIGNANCIES IN NORTHERN ALBERTA 1962-71. (E.) Burns, P. E. (Cross Cancer Inst., Edmonton, Canada) and M. Grace. *Vth Perugia Quadrennial Intl Conference on Cancer* 10, 1973.

- 5765 EPIDEMIOLOGIC STUDY OF CANCER OF THE BREAST AND ITS RELATIONSHIP TO BILIARY AND COLON DISEASE. (E.) Fratkin, L. B. (Dept. Surgery, U. British Columbia, Vancouver, Canada). *Vth Perugia Quadrennial Intl Conference on Cancer* 8, 1973.

5766 THIRTEEN YEAR SURVEY OF SKIN CANCER INCIDENCE IN THE PRIVATE PRACTICE OF DERMATOLOGY. (E.) Schreiber, M. M. (Tucson Med. Park, Arizona) and S. I. Shapiro. *Cutis* 12(5):750-752, 1973.

5767 OPERATION AND RESULTS OF A SCREENING PROGRAM FOR CANCER OF THE BREAST. (E.) Barker, W. F. (U. California Sch. Med., Los Angeles), H. I. Machleder, L. Sperling, A. H. Dowdy and R. H. Gold. *Am Surg* 39(12):663-666, 1973.

5768 HODGKIN'S DISEASE IN CHILDREN. (E.) War-
kel, R. L. (Royal Army Med. Coll., London,
England) and J. B. Stewart. *Lancet* (7841):1332,
1973.

5769 STUDY ON EPIDEMIOLOGY OF MALIGNANT NEO-
PLASMS OF THE UPPER RESPIRATORY TRACT
AND ORAL CAVITY IN THE TURKMEN SSR. (Rus.)
Nuryagdyev, S. K. (Res. Inst. Oncol., Ashkhabad,
USSR) and A. I. Aronsky. *Vopr Onkol* 19(10):56-61,
1973.

5770 INCIDENCE OF OCCUPATIONAL CANCERS: SEVEN
CASES IN ONE FACTORY. (Fr.) Bresson, J. R.
(No affiliation), J. Bertholon, R. Soubrier and F.
Habozit. *Arch Mal Prof* 34(9):565-567, 1973.

5771 SOME CHARACTERISTICS OF CANCER MORBIDITY
AND MORTALITY IN THE USSR. (Rus.) Pre-
obrazhenskaia, M. N. (Ministry Hlth. USSR, Moscow),
G. F. Tserkovnyi and Z. E. Shtraus. *Vest Akad Med
Nauk SSSR* (3):84-87, 1973.

5772 THE EPIDEMIOLOGY OF MULTIPLE PRIMARY
CANCERS. (E.) Schottenfeld, D. (Sloan
Kettering Mem. Cancer Ctr., New York, N.Y.). *Vth
Perugia Quadrennial Intl Conference on Cancer*
4, 1973.

5773 OVARIAN CARCINOMA IN CALIFORNIA: THE CALI-
FORNIA TUMOR REGISTRY DATA. (E.) Krain,
L. S. (U. California Med. Ctr., Los Angeles). *Obstet
Gynecol Survey* 27(9):695-697, 1972.

See also:

- * (Rev): 5402, 5413, 5426
- * (Chem): 5461, 5543
- * (Immun): 5617

- 5774 THE MECHANISM OF REGULATION OF FIBROBLASTIC CELL REPLICATION. II. PARTICIPATION OF THE NUCLEOLI. (E.) Mironescu, S. (Dept. Path., Thomas Jefferson U., Philadelphia, Pa.), K. A. O. Ellem and R. Love. *J Cell Physiol* 82(3):445-460, 1973.

Cultures of human diploid fibroblasts (HDFs) exhibiting density dependent inhibition of replication (DDIR) resumed their progression through the cell cycle following medium replacement and, after a lag period of 2 hr, showed a dramatic increase in the incidence of isonucleolar cells and in the uptake of ^3H -uridine into the nucleoli. Between 5 and 10 hr after refeeding these nucleolar changes were maximal, leveling off at the highest values, in periods corresponding to late G1 and early S. Concomitantly, a parallel increase in the number of nucleoli per cell occurred. As the cells progressed through S and G2 phases, the nucleoli decreased in number and reverted to the anisonucleolar type. The intensity of nucleolar labeling by ^3H -uridine and its correlate, the frequency of cells with labeled nucleoli, also decreased during these cell cycle stages. Both the pre- and postreplicative periods of mitotic quiescence were characterized by high levels of anisonucleoliosis (60-80% of the cells) and by very low levels of nucleolar ^3H -uridine incorporation. The magnitude of these nucleolar changes occurring during the G1 stage was strongly dependent on: the duration of contact between the cells and the fresh medium, at least 8 hr of contact being necessary for a maximal response; the amount of serum in the medium, the optimal serum concentration being between 10 and 50%; and the pH of the medium. The nucleolar response was completely abolished at pH values below 7.0. These nucleolar changes were very sensitive to the presence of cycloheximide (10 $\mu\text{g}/\text{ml}$) and actinomycin D (0.003 $\mu\text{g}/\text{ml}$). The behavior of the nucleoli in response to these parameters was similar to the activation response of the cells to the initiation of DNA synthesis. These results indicate that the nucleolar changes are necessary but not sufficient for the subsequent initiation of DNA synthesis, since with graded serum concentrations or medium volumes, smaller levels of a stimulus were needed to produce maximal isonucleoliosis than to effect a maximum replicative response in the cells.

- 5775 REGULATION OF THE CELL CYCLE IN ANIMAL CELLS. (E.) Smith, J. A. (Imperial Cancer Res. Fund, London, England). *Biochem Soc Trans* 1(5):1078-1081, 1973.

It is suggested that the time following cell mitosis and preceding DNA synthesis is composed of 2 fundamentally different periods. One period, called the B-phase, is the orderly sequence of events necessary for division to occur. The other phase, called the A-state, comprises the remainder of time before synthesis begins and no such orderly sequence occurs in this period. The length of time any given cell remains in this A-state varies, but the probability that the cell will enter B-phase in the next instant remains constant, under constant environmental conditions. Thus it is the transition probability, the

probability that a cell will enter B-phase, which governs the rate of proliferation. Changing this transition probability will change the proliferation rate. It is concluded that present knowledge does not allow the statement that steroids or other mitogenic substances specifically initiate a sequence of events leading directly to DNA synthesis. Indeed, it seems instead that these substances merely work to increase the probability that initiation will occur.

- 5776 HAMSTER LYMPHOSARCOMATOSIS AND SARCOMAS INDUCED BY HUMAN LEUKEMIC MATERIAL. I. THE ACTION OF LEUKEMIC HUMAN SPLEEN AND LYMPH NODES SUSPENSION ON SYRIAN HAMSTER. (E.) Nastac, E. (Stefan S. Nicolau Inst. Virology, Bucharest, Rumania), T. Ionescu, P. Athanasiu, R. Demetrescu, V. Velciu and N. Ursea. *Neoplasma* 20(6):655-663, 1973.

Suspensions of spleen and lymph nodes from a case of human acute paramyeloblastic leukemia were injected via the intrasplenic route into 3 to 4-day-old Syrian hamsters. Several of these animals subsequently developed malignant neoplasms which were microscopically diagnosed as lymphosarcomas and polymorphous sarcomas. Young animals inoculated s.c. or intrajugularly with suspensions from these tumors invariably developed tumors. The livers of the tumor-bearing animals appeared enlarged and pearled, with the liver parenchyma being reduced to very small red areas. Indirect immunofluorescence studies showed granular fluorescence in the cytoplasm of the tumoral and spleen cells of the tumor-bearing hamsters, with occasional fluorescence in the liver, lung, brain, and kidneys. The fluorescence was very intense in the presence of human chronic leukemia serum and less intense and much less frequent in the presence of sera from homologous tumor-bearing hamsters. The results indicate that the hamster tumors were induced by an agent present in the human leukemic material.

- 5777 INTERACTION OF ACTIVATED ESTRADIOL-RECEPTOR COMPLEX AND CHROMATIN IN ISOLATED UTERINE NUCLEI. (E.) Leclercq, G. (Turner Ctr., Free U. Brussels, Belgium), N. Hulin and J. C. Heuson. *Eur J Cancer* 9(9):681-685, 1973.

Exposure at 4 C and 22 C of purified uterine nuclei from Sprague-Dawley rats to uterine cytosol preincubated with estradiol-17 β caused a significant increase in their ability to bind ^3H -actinomycin D; the effect was greater at 4 C than at 22 C. This increase reached a near maximum within 15 min of the initial exposure. It did not occur at 4 C when the nuclei were exposed to cytosol and estradiol-17 β immediately before mixing or when the nuclei were exposed to cytosol preincubated with estrone, cytosol alone, buffer added to estradiol-17 β or estrone, or buffer alone. Exposure of nuclei from the uterus or the diaphragm to cytosols from these tissues increased the nuclear binding of ^3H -actinomycin D only when the uterine nuclei were exposed to uterine cytosol. The data suggest that a change in the chromatin structure occurs in isolated nuclei from

estrogen-target tissues as a specific effect of exposure to estradiol-"activated" uterine cytosol. They are consistent with the hypothesis that the "activated" form of the estrogen receptor induces metabolic changes in target tissues via a direct effect at the chromatin level.

- 5778 ATTEMPTS TO PRODUCE CANCER IN EPIDERMIS
BY ISOLATION *IN VIVO*. (E.) Tarin, D.
(Sch. Med., Leeds, England) and A. Sturdee. *Oncology*
28(4):378-384, 1973.

Sheets of pure epidermis derived from the back skin of mice were implanted into the anterior chamber of the right eye and into the peritoneal cavity of syngeneic mice of the C57bl, A, CBA, and CBAH strains. Control animals received implants of full thickness skin, or operations with no implantation. Histologically and macroscopically, the changes seen in the eyes following epidermal implantation resembled those seen following incision of the cornea without subsequent implantation; there was no evidence of implant invasion into adjacent tissues. Similarly, none of the epidermal implants in the peritoneal cavity showed evidence of progressive growth or the destruction of adjacent tissue. Thus, it is unlikely that the regular organization of the skin is a product of a balance between persistent invasive tendencies displayed by epidermis and restraint exercised by the dermis, or that carcinogenesis is the result of a failure of such a dermal function. The data indicate that epidermal neoplasia is not the outcome of mere removal or failure of dermal control, but more likely of abnormal influences exerted by the dermis and/or derangements in the epidermis itself. Further, epidermis, like bladder epithelium, is a weak inducer of bone formation.

- 5779 INTERACTION OF EXOGENOUS DNA WITH MAMMALIAN
CELLS *IN VITRO*. I. KINETICS OF INCORPORATION
OF EXOGENOUS DNA INTO MAMMALIAN CELLS. (E.)
Keprtova, J. (Inst. Biophysics, Czechoslovak Acad.
Sci., Brno). *Neoplasma* 20(6):671-678, 1973.

The *in vitro* interaction of exogenous DNA with mammalian cells was investigated in both homologous and heterologous systems. If the homologous DNA incorporated into the cells was of rat thymus origin, the greater part of the exogenous DNA, labelled with thymidine-³H, was bound to the lymphocytes after a 1/2 hr incubation of the lymphocytes with the DNA. Investigation of the uptake of heterologous or isologous DNA-³H by mouse fibroblasts of L-strain showed that, in both cases, exogenous DNA was bound to the L-cells during a 24 hr cultivation. Concomitantly, the labelling of L-cells by heterologous DNA isolated from *E. coli*, increased during the course of 24 hr incubation. In the case of isologous DNA-³H, much exogenous DNA was already bound to the L-cells during the course of the first 6 hr of incubation. Further, the amount of isologous DNA bound to the L-cells showed virtually no increase. Another difference between heterologous and isologous DNA may be found in the velocity of the degradation occurring in the cultivation medium of L-cells. If

the cultivation medium of the cells was supplemented with bacterial DNA-³H, even after only 12 hr incubation, almost 95% of the DNA was degraded to an acid-soluble material. The course of DNA degradation was found to slow down 2-fold when the DNA added to the cultivation medium was of isologous nature.

- 5780 ONCOCYTIC AND ONCOCYTOID TUMORS OF THE
SALIVARY GLANDS. (E.) Johns, M. E. (U.
Michigan Med. Ctr., Ann Arbor), J. G. Batsakis and
C. D. Short. *Laryngoscope* 83(12):1940-1952, 1973.

Six oncocytic tumors of the salivary glands were examined by histochemical methods and electron microscopy. The tumor site was the nasal cavity in two cases, the parotid gland in three, and the larynx in one. All oncocytes were rich in mitochondria, and most also exhibited increased amounts of oxidizing enzymes by histochemical examination. Electron microscopic findings included two oncocytic cells (epithelial and myoepithelial), marked hyperplasia of mitochondria, 8-type glycogen in cytoplasmic matrix and in granular deposits in mitochondria, relative paucity of other cell organelles (lysosomal bodies and secretory granules), and desmosomal attachment between oncocytes. Of the six cases, three were diagnosed as oncocytic carcinomas. Use of the term "oncocytoid" is suggested for cells not fulfilling minimal histochemical requirements for the oncocyte.

- 5781 ELECTROPHORETIC PROPERTIES OF THE PRODUCT
OF PROTEIN SYNTHESIS IN MITOCHONDRIA OF
RAT LIVER AND ZAJDELA HEPATOMA. (E.) Kuzela, S.
(Cancer Res. Inst., Slovak Acad. Sci., Bratislava,
Czechoslovakia), J. Kolarov and V. Krempasky. *Neoplasma* 20(6):623-630, 1973.

Normal Wistar rats and animals bearing Zajdela hepatomas were injected with cycloheximide (62 mg/kg), ¹⁴C-leucine, and ¹²C-leucine, after which they were sacrificed and the mitochondria isolated from the livers and hepatomas. The mitochondria were then separated into soluble and insoluble fractions. ¹⁴C-leucine was incorporated preferentially into the insoluble fraction, with the incorporation into this fraction being more sensitive to chloramphenicol than the incorporation into the whole mitochondria or the soluble fraction. Extraction of the insoluble fraction with a chloroform-methanol mixture doubled the specific activity; the fraction thus extracted was sensitive to chloramphenicol. There were no differences in the relative specific activities of the respective fractions from the liver and hepatoma; nor did the mitochondria from these sources differ in their electrophoretic properties. Chloramphenicol most markedly inhibited the incorporation of ¹⁴C-leucine into the low molecular wt (9000 to 12,000) protein(s) of the insoluble fraction. A single radioactive maximum was found following electrophoretic separation of the chloroform-methanol extracts from the insoluble fractions. The molecular wt of the chloroform-methanol extracted protein (or lipoprotein) was 9000; it was the same for both the liver and tumor mitochondria. The

data indicate that the insoluble mitochondrial fraction and the chloroform-methanol extract of this fraction were enriched by the product of mitochondrial protein synthesis.

- 5782 THE SPONTANEOUS OCCURRENCE OF APOPTOSIS IN SQUAMOUS CARCINOMAS OF THE UTERINE CERVIX. (E.) Searle, J. (Dept. Path., U. Queensland, Australia), D. J. Collins, B. Harmon and J. F. R. Kerr. *Pathology* 5(2):163-169, 1973.

A distinctive type of individual cell necrosis occurring in squamous carcinomas of the human uterine cervix was studied by light and electron microscopy. The first stage of the process involves the condensation and fragmentation of scattered tumor cells, with the production of compact, membrane-bounded bodies in which the organelles appear well preserved. These are then phagocytosed by either neoplastic epithelial cells or histiocytes, and are degraded by lysosomal hydrolases. The phenomenon is identical to the shrinkage necrosis or apoptosis which has been described in non-neoplastic tissues under both physiological and pathological conditions, and in several other neoplasms. The findings indicate that cell loss by this means is often considerable in cervical carcinomas, and are consistent with the hypothesis that the spontaneous occurrence of apoptosis might largely account for the discrepancy known to exist between the rate of cell multiplication in malignant tumors and their rate of growth.

- 5783 HISTOCHEMICAL ASPECTS OF HYDATIDIFORM MOLE AND CHORIOCARCINOMA. (E.) El-Fiky, S. M. (Dept. Zoology, U. Libya, Tripoli), A. M. Kolkaila, D. S. Dawd and R. M. A. Wahab. *Acta Histochem (Jena)* 47(1):115-123, 1973.

The histochemical localization and changes in the RNA, DNA, proteins, and glycogen of hydatidiform moles and choriocarcinomas were studied. These parameters were unchanged in the malignant cells of the choriocarcinomas with regard to form and topographical distribution; however, their concentrations were elevated. Further research is needed to determine whether these observations are peculiar to the particular type of tumor cells studied.

- 5784 EXPRESSION OF TUMORIGENICITY AFTER CELL HYBRIDIZATION *IN VITRO*. (E.) Spurna, V. (Inst. Biophysics, Czechoslovak Acad. Sci., Brno) and K. Dvorak. *Neoplasma* 20(6):687-694, 1973.

Hybrid populations formed by the fusion of mouse lymphosarcoma cells (LS/BL strain) with L-cells (HGPRT-, R-AG/50 strain) produced clones differing in phenotype, growth capacity, number of chromosomes, and tumorigenicity from the parental lines. In comparison with that of the parental lymphosarcoma line, the tumorigenicity of the hybrid cells was substantially lower. Following i.p. application of the hybrid cells to C57BL mice, lymphosarcomas and sarcomas differing histologically from those induced by the

parental lines appeared. Repression of the tumorigenicity of the hybrid cells and a loss of the phenotypic characteristics of a lymphosarcoma may occur due to an extensive loss of the telocentric chromosomes originating in the LS/BL lymphosarcoma cells: these chromosomes were preferentially eliminated from the hybrid genome during *in vitro* cultivation. Parallel with this reduction, an expression of the phenotypic characteristics of the L-cells modifying the histological structure of the tumor to that of a reticulosarcoma or to spindle-cellular sarcoma took place.

- 5785 INTERACTION OF EXOGENOUS DNA WITH MAMMALIAN CELLS *IN VITRO*. II. EFFECT OF DEAE-D ON INTERACTION OF EXOGENOUS DNA WITH L-CELLS. (E.) Keprtova, J. (Inst. Biophysics, Czechoslovak Acad. Sci., Brno) and E. Minarova. *Neoplasma* 20(6):679-686, 1973.

Monolayer cultures of L-cells were preincubated with varying concentrations of diethylaminoethyl dextran (DEAE-D), after which isologous DNA was added to the cultivation medium and the kinetics of incorporation into the host cells and nuclei studied. Preincubation with 500 µg/ml DEAE-D greatly increased the amount of exogenous DNA bound to the L-cells. Following the application of DEAE-D, the amount of exogenous DNA bound to the L-cells was 20-times higher than without DEAE-D. During the first 6 hr of incubation, much of the isologous DNA was bound to the host cell surface, with only a portion penetrating into the nucleus; the amount of exogenous DNA incorporated into the host cell nuclei was several times greater following preincubation with DEAE-D. Further, the DNA added to the cultivation medium was degraded more slowly following DEAE-D application. The uptake of exogenous DNA by L-cells appears to be stimulated by DEAE-D via mechanisms involving the protection of exogenous DNA against enzymatic degradation and the support of cellular penetration by reaction with the cell surface.

- 5786 AN ORGAN CULTURE STUDY OF FROG RENAL TUMOR AND ITS EFFECTS ON NORMAL FROG KIDNEY *IN VITRO*. (E.) Morek, D. M. (Dept. Biol., U. Notre Dame, South Bend, Ind.). *Oncology* 28(6):536-552, 1973.

Normal frog kidney tissues were cultivated with pieces of frog renal tumor or exposed to tumor filtrates and maintained in a new vertical type of organ culture at 9, 12, 18, 22 or 25 C. Tumor tissue at 25 C was still actively growing after 5 to 6 wk in culture but frequently showed central necrosis at this time; no limit was found for tumor maintenance at 9 C. When actively growing noninclusion tumors were put into organ culture at 9 C, characteristic herpes-type nuclear inclusion bodies could be found after 6 wk; the percentage of inclusion body cells increased with time spent at low temperatures. Cultures kept at 25 C developed no inclusions and lost previously developed inclusion bodies. After 8 wk, all kidney cultures incubated with renal tumor tissues showed signs of malignant transformation, the

first instances of transformation being seen after 7 wk in the 9 C cultures. Only 1 of 14 transfilter controls and none of 46 general control cultures (kidney alone in culture) could be classified as transformed. Kidney cell transformation was not dependent on direct cell contact, and transformational changes were seen in kidney tissues preincubated with cell-free inoculum. The transforming kidney tubule cells also showed an increased uptake of labeled thymidine, indicating a stimulation of DNA synthesis. Thus, the temperature-associated, summer-winter cycle of herpes-type viral nuclear inclusion bodies observed in the Lucke tumor in nature was duplicated *in vitro*.

- 5787 MORPHOLOGICAL MUTANTS OF *NEUROSPORA CRASSA*: POSSIBLE EVIDENCE OF ABNORMAL MORPHOLOGY DUE TO CHANGES IN DNA COMPOSITION. (E.) Chaudhuri, R. K. (Dept. Botany, Howard U., Washington, D.C.), S. K. Dutta and M. Ojha. *Oncology* 28(6):553-566, 1973.

The wild type strain 74A of *Neurospora crassa* and seven experimentally induced morphological mutants were examined to determine the molecular basis for the morphological abnormalities. DNA from these fungi showed typical bimodal denaturation profiles in a Gilford 2400 spectrophotometer. The "slime" and "ropy" mutants showed comparatively high proportions of A + T rich DNA sequences. The DNA sequences of the slime mutant were distinctly different from those of the parental strain 329 and the wild type 74A; the slime mutant DNA showed less homology and less thermal stability in the heteroduplexes with its parental strain and the 74A wild type. No such differences were noted in any other mutant or natural isolate of *N. crassa* tested. These data indicate that the morphological variations of the slime mutant may be due to changes in its DNA composition.

- 5788 ADRENAL SECRETION OF ESTROGENS, GLUCOCORTICOSTEROIDS AND MINERALOCORTICOSTEROIDS IN THE DOG. (E.) Dor, P. (Inst. Jules Bordet, Tumor Ctr., Free U. Brussels, Belgium), V. Keymolen, M. de Rood, S. Levin and A. Borkowski. *Eur J Cancer* 9(9):687-690, 1973.

The secretion rates of cortisol, corticosterone, aldosterone, estradiol, and estrone by isolated canine adrenal glands perfused *in situ* were compared. Despite a progressive increase in glucocorticosteroid secretion with increasing levels of ACTH stimulation, the ratio of cortisol to corticosterone remained remarkably constant, as did the ratio of corticosterone to aldosterone. While the secretion of estradiol and estrone can be detected in the adrenal effluent plasma at various levels of ACTH stimulation, this secretion was extremely low. When compared to the secretion of cortisol plus corticosterone, the secretion of estrogen was from ten thousand to several hundred thousand times smaller. Thus the canine adrenal gland is capable of secreting estrogens, but only at extremely low levels. By extrapolation, it appears that most of the estro-

gens produced by castrate or postmenopausal women might derive from a peripheral conversion of the adrenal androgens. The data further point out the nonspecific dependence of aldosterone on ACTH stimulation.

- 5789 TRANSPLANTATION OF HUMAN TUMOUR TO IMMUNE DEPRIVED MICE TREATED WITH ANTI-THYMOCYTE SERUM. (E.) Detre, S. I. (St. George's Hosp., London, England) and J. -C. Gazet. *Br J Cancer* 28(5):412-416, 1973.

Eighteen primary human carcinoma explants were grown progressively for a minimum of one month in thymectomized, x-irradiated A2G mice reconstituted with syngeneic bone marrow and subsequently treated with anti-thymocyte serum. Four colorectal and one gastric mucus secreting carcinomas developed locally in the mice; none of the tumors metastasized, although invasion of the ribs occurred in one case. None of the human breast carcinomas grew in the mice. This method can provide a model for growing human colorectal carcinomas obtained at operation.

- 5790 ANGIOGRAPHIC LOCALISATION OF A PHEOCHROMOCYTOMA IN THE ORGAN OF ZUCKERKANDL. REPORT OF A CASE. (E.) Czekala, Z. (Central Mining Hosp., Bytom, Poland). *Acta Radiol* 14(4):491-494, 1973.

A pheochromocytoma arising in the organ of Zuckerkandl was localized by angiography in a 43-yr-old female who was admitted with polydipsia, polyuria, headache, and slight left epigastric pain together with hypertension and disturbance of vision for 15 yr. Nephroangiography revealed a richly vascularized, well-defined tumor to the left of L2 to L4. The adrenals were normal. Selective angiography showed that the tumor's blood supply arose from the inferior mesenteric and middle colic arteries. At surgery, a tumor was removed from the retroperitoneal space above the bifurcation of the aorta. Histologic diagnosis was pheochromocytoma. Survey of the literature revealed only 24 other cases of pheochromocytoma arising in the organ of Zuckerkandl. Only one of these had been diagnosed by angiography prior to surgery.

- 5791 SERUM RIBONUCLEASE IN UROLOGIC CANCER. RELATION TO HOST IMMUNOCOMPETENCE. (E.) Catalona, W. J. (James Buchanan Brady Urological Inst., Baltimore, Md.), P. B. Chretien, W. J. Matthews and J. L. Tarpley. *Urology* 11(5):577-581, 1973.

Circulating serum ribonuclease (S-RNase), an enzyme with immunosuppressive properties, was assayed in 42 patients with urologic cancer. Increased levels of S-RNase were found in 14 of 19 patients with prostatic carcinoma, 6 of 6 patients with renal cell carcinoma, 5 of 6 patients with bladder carcinoma, but in only 1 of 8 patients with testis tumors. A significant correlation between S-RNase levels and the extent of tumor was demonstrated in patients

with prostatic carcinoma, but not in patients with other urologic malignant conditions. A significant correlation was also found between S-RNase and host cell-mediated immunocompetence as measured by delayed cutaneous hypersensitivity to dinitrochlorobenzene. The results suggest that the S-RNase assay may be of clinical use in experimental treatment programs to reflect fluctuations of tumor status when subtle effects on tumor growth may be obscured by the advanced tumor state.

- 5792 ASPARAGINE-REQUIRING TUMOR CELL LINES AND THEIR NON-REQUIRING VARIANTS: CYTOGENETICS, BIOCHEMISTRY AND POPULATION DYNAMICS. (E.) Colofiore, J. (Dept. Physiol. Cell Biol., U. Kansas, Lawrence), J. Morrow and M. K. Patterson, Jr. *Genetics* 75(3):503-514, 1973.

Asparagine-requiring Jensen and Walker rat tumor cells and their asparagine-independent variants were analyzed. Both cell lines have very low levels of asparagine synthetase, and non-requiring revertants isolated from these lines have elevated levels of the enzyme. No differences in chromosome number were detected between the parent Jensen line and five Jensen non-requiring revertants isolated from it. Both Jensen and Walker cells undergo asparagineless death when deprived of this amino acid, although the Jensen cells do so at a more rapid rate. Jensen requiring lines are at a selective advantage when grown in competition with non-requiring variants in complete medium, and their growth rate is more rapid when grown separately. The selective coefficients for the variant with respect to the asparagine-requiring parent ASN- line were 0.94 for the competition experiments and 0.83 for growth rate estimates. A somatic cell hybrid between Chinese hamster cells (which require asparagine at low densities, and possess measurable synthetase activity) and the Walker line was asparagine-independent, and it possessed enzyme levels equivalent to the hamster parent. The results of these investigations suggest a parallel with microbial auxotrophic mutants and can be understood in terms of alterations within nuclear structural genes.

- 5793 FAMILIAL DIFFUSE POLYPOSIS OF THE COLON AND RECTUM: SUPPLEMENTARY REPORT ON THREE PEDIGREES. (E.) Schutte, A. G. (St. Joseph's Hosp., Milwaukee, Wis.). *Dis Colon Rectum* 16(6):517-523, 1973.

Three pedigrees representing familial diffuse polyposis of the colon and rectum are presented. These data reveal considerable variation in the severity of familial polyposis and unpredictability with regard to its course as found in members of related and unrelated families. After the onset of polyposis, the symptoms which emerge are dependent upon the rate of increase in the number and/or size of the adenomas and/or the development of adenocarcinoma. In the family members studied, the onset of polyposis in the first two decades of life was common, and those who failed to show its onset during this period remained free of manifestations through-

out the third and fourth decades. Beyond the teen years, each additional decade of freedom from the onset of familial polyposis greatly increases the probability that a member of an affected family has escaped this inherited disease. An affected member cannot be assured that he or she is free of the risk of recurrence and/or the development of adenocarcinoma so long as any remnant of the large intestine is retained.

- 5794 MYCOBACTERIA AND LYMPHORETICULAR TUMOURS IN *XENOPUS LAEVIS*, THE SOUTH AFRICAN CLAWED TOAD. I. ISOLATION, CHARACTERIZATION AND PATHOGENICITY FOR *XENOPUS* OF *M. MARINUM* ISOLATED FROM LYMPHORETICULAR TUMOUR CELLS. (E.) Clothier, R. H. (Sch. Biol. Sci., U. East Anglia, Norwich, England) and M. Balls. *Oncology* 28(5):445-457, 1973.

Bacteria isolated from *Xenopus* lymphoreticular tumor cells were cultured and identified as *Mycobacterium marinum*, a well-known opportunistic pathogen. When 3 million to 300 million bacteria were injected into *Xenopus* toadlets, all animals died within 50 days; animals injected with 300 to 30,000 bacteria recovered. Lethal doses of *M. marinum* resulted in lymphoid tissue development in the spleen red pulp, the appearance of histiocytic lesions in the kidneys, and in the occurrence of histiocytic lesions in the liver; sublethal doses caused an increase in the number of small lymphocytes in the spleen, liver, and kidneys. Whereas large doses of the cultured bacteria induced granulomas, lymphoreticular tumors were not induced by either lethal or sublethal doses of *M. marinum*, or by cell-free preparations made from the bacteria or from bacterium-infected cell cultures. The data indicate that the presence of mycobacteria is a secondary result and not a primary cause of lymphoreticular lesions in *Xenopus*.

- 5795 ULTRASTRUCTURAL STUDIES ON THE ACUTE LEUKEMIC LYMPHOBLAST. (E.) Schumacher, H. R. (Harrisburg Hosp., Pa.), I. E. Szekely, S. A. Park and D. R. Fisher. *Blut* 27(6):396-406, 1973.

Electron microscopic studies were performed on normal lymphoblasts obtained from the lymph nodes of ten surgical patients without hematologic disease. Bone marrow was obtained from six patients with acute lymphoblastic leukemia for comparison studies. The normal lymphoblast was significantly larger in total cell area, total cell length, nuclear length, and cytoplasmic area. In addition, the leukemic lymphoblasts showed bizarre nuclear pockets, increased nucleoli, nuclear membrane duplication, increased numbers of disrupted mitochondria, virus-like particles within the mitochondria, and increased numbers of small granules within the mitochondria. The location of centrioles outside the nuclear pockets may make leukemic lymphoblasts more sensitive to vincristine than leukemic myeloblasts or monoblasts. The disrupted mitochondria with associated virus-like particles may offer important clues to leukemogenesis. It would appear that quantitative and qualitative

ultra-structural findings are important in lymphoblastic leukemia and that the preliminary findings in this study should be pursued using more sophisticated techniques.

- 5796 CYTOGENETICS OF MALIGNANT LYMPHOMAS. STUDIES UTILISING A GIEMSA-BANDING TECHNIQUE. (E.) Reeves, B. R. (Royal Marsden Hosp., London, England). *Humangenetik* 20(3):231-250, 1973.

The tumor chromosomes from 10 cases of malignant lymphoma (3 cases of Hodgkin's disease (HD) and 7 cases of non-Hodgkin's lymphoma (ML)) were analyzed using a recently developed chromosome banding techniques. All of the tumors contained both numerical and structural chromosome abnormalities. Some of these were the result of simple deletions, while others were more complex, involving translocation and isochromosome formation. The breakpoints almost always appeared in the light-staining bands and at the centromeres, suggesting that certain chromosome regions in the abnormal cells may be preferentially involved in structural changes. Several of the structural changes were noted in more than one tumor: number 3 chromosomes were deleted in 5 cases and involved in translocations in 2 cases; short-arm deletions of number 1 chromosomes were noted in 2 cases, number 9 chromosomes were involved in translocations in 2 cases; 4 cases had deletions of chromosome 6; translocations involving chromosome 12(12q+) were found in 2 cases; additional long-arm material on chromosome 14 was seen in 2 cases; and isochromosomes were seen in 3 cases. Many cases of HD can be separated from most ML on the basis of chromosome number; nearly half of HD cases have between 44 and 56 chromosomes. In addition to populations of chromosomally abnormal cells, unstimulated cultures from many lymphoid tumors may yield some normal diploid mitoses. These are generally most abundant in cases of HD, their presence in ML being more variable.

- 5797 SYNERGISM *IN VITRO* BETWEEN ATTENUATED AND VIRULANT BACTERIA WHICH AFFECTS THE ONCOGENICITY OF *AGROBACTERIUM TUMEFACIENS* (SMITH AND TOWN). (Fr.) Le Goff, L. (Pasteur Inst., Paris, France) and P. Manigault. *C R Acad Sci Paris* 277(20):2173-2176, 1973.

In vitro experiments demonstrated that the oncogenicity of *Agrobacterium tumefaciens* can be enhanced by growing a virulent strain of bacteria (A_6) in the supernatant from a medium in which an attenuated variant (93) of *A. tumefaciens* had previously been grown. Best results were obtained when the 93 variant was removed at the end of the exponential phase of growth and the virulent A_6 strain was allowed to grow in the supernatant for 3-4 hr. Sterilization of the supernatant at 110 C for 20 min had no effect on enhancement of the oncogenicity of the A_6 strain, but this enhancement was reduced by dialysis against Stoll lactate for 16 hr or by preliminary treatment of the supernatant with pancreatic ribonuclease (50 μ g/ml). Addition of ribonuclease to the culture

2 hr after inoculation of the virulent A_6 strain had no effect on enhancement. These findings suggest that RNA from the attenuated 93 variant of *A. tumefaciens* is one of the factors causing *in vitro* enhancement of the oncogenicity of the A_6 strain. It is possible that enhancement of oncogenicity is due either to an increase in the proportion of bacteria which effectively participate in tumor induction or to a temporary increase in the oncogenicity of the bacteria.

- 5798 STEROID METABOLISM *IN VITRO* BY AN INTERSTITIAL CELL TUMOUR AND THE ATTACHED PRE-PUBERTAL TESTIS. (E.) Richards, G. (Royal Cancer Hosp., Chester Beatty Res. Inst., London, England) and A. M. Neville. *J Endocrinol* 59(3):637-649, 1973.

A virilizing interstitial cell tumor and the attached testicular tissue from a 4-yr-old boy were incubated *in vitro* with [7α - 3 H]pregnenolone and [4 - 14 C]progesterone, or [4 - 14 C]-androstenedione and [7α - 3 H]5 α -dihydrotestosterone. Ring A saturated steroids were produced from 4-ene precursors by the prepubertal testis, but this tissue was unable to convert pregnenolone or progesterone to 17 α -hydroxylated C₂₁ steroids or to C₁₉ steroids. The virilizing interstitial cell tumor metabolized pregnenolone and progesterone to 17 α -hydroxyprogesterone, androstenedione, and testosterone. In addition, dehydroepiandrosterone was detected as a product of pregnenolone. The tumor lacked 4-ene-5 α -steroid reductase activity. 5 α -Dihydrotestosterone was metabolized to 5 α -androstane-3,17-dione, androsterone, isoandrosterone, 5 α -androstane-3 α ,17 β -diol and 5 α -androstane-3 β ,17 β -diol in both the normal and tumor tissue.

- 5799 MYCOBACTERIA AND LYMPHORETICULAR TUMOURS IN *XENOPUS LAEVIS*, THE SOUTH AFRICAN CLAWED TOAD. II. HAVE MYCOBACTERIA A ROLE IN TUMOUR INITIATION AND DEVELOPMENT? (E.) Clothier, R. H. (Sch. Biol. Sci., U. East Anglia, Norwich, England) and M. Balls. *Oncology* 28(5):458-480, 1973.

Lymphoreticular tumors, mycobacterial granulomas, and responses to antigens were compared in *Xenopus laevis* toadlets. The results indicate that the tumors induced by the injection of cell-free tumor extracts into *Xenopus* toadlets are distinguishable from granulomas on histological grounds, including differences in the degree of involvement of the liver cortex, the distribution of cells in the S and M phases of the cell cycle, and the distribution and degree of involvement of small lymphocytes. Although the mycobacteria do not seem to initiate the development of lymphoreticular tumors, they become involved as secondary contaminants in the later stages of the neoplastic disease and are probably contributory factors in the death of affected animals. It appears that an uncommon specific factor (a particular virus?) rather than ubiquitous specific factors (mycobacteria) is responsible for lymphoid tumor initiation in *Xenopus*. Amphibians seem to have a high degree of natural resistance to mycobacteria. However, if very large

doses of mycobacteria are injected into them or if they are weakened by other diseases or environmental conditions, the relationship between the amphibian and the bacteria changes, with the result that granulomas or secondary infections develop.

5800 ACTIVITY OF POLYPHENOL OXIDASE EXTRACTED FROM MELANOMAS FROM HORSES. (Fr.)

Kleisbauer, J. P. (Unit 119, INSERM, Marseille, France), L. Aubert and H. Bonneau. *C R Soc Biol* 167(1):84-87, 1973.

Polyphenol oxidase present in the supernatant of homogenized melanomas from gray horses had a characteristic absorption maximum at 475 nm when L-dopa was used as a substrate. The optimum pH for this enzyme was 8 and the energy of thermal inactivation was 10,000 cal/mol. The enzyme was heat resistant (half-life at 55°C = 10 min and at 67°C = 17 min) and had a K_m of 0.5 mM with L-dopa. Enzyme activity was lost by dialysis against diethylammonium N,N-diethyldithiocarbamate, a specific chelating agent for copper, and was restored by incubation with 0.1 mM copper sulfate, demonstrating that polyphenol oxidase contains copper. Polyacrylamide gel electrophoresis revealed the presence of three isoenzymes. These isoenzymes failed to oxidase monophenols, even in the presence of dopa, and had no effect on phenols with primary amine substituents. Dopa was oxidized rapidly, catechol slowly, and no reaction occurred with pyrogallol, methylcatechol or epinephrine. These enzymes were more active with L- than with D- or DL- forms of diphenols. The activity of these polyphenol oxidases was inhibited by a methyl group in the 1 position or a hydroxyl group in the 5 position. Since these isoenzymes can oxidize dopa but not epinephrine, a methylene group in the α -position appears to be essential to their activity. The high specificity of these *o*-diphenol oxidases poses problems since dopa is not a naturally occurring amino acid and must be synthesized by the body. It is suggested that the gray horse may have a disorder in dopa metabolism which, in some cases, causes abnormalities in melanin production and results in a malignant process.

5801 INVESTIGATION OF A NEW RENAL TUMOR MODEL.

(E.) Hrushesky, W. J. (Roswell Park Memorial Inst., Buffalo, N. Y.) and G. P. Murphy. *J Surg Res* 15(5):327-336, 1973.

A study was undertaken to develop, describe and characterize a new transplantable renal cell carcinoma model which may be more closely analogous to the human renal cell tumor and which may serve as a basis for the preliminary evaluation of new therapies of this disease in man. The tumor arose spontaneously as a renal adenocarcinoma in an inbred Balb C/Cr mouse. The tumor is transferred by a single cell suspension. Preliminary investigation of the tumor model included comparison of percentage of tumor takes, tumor wt, and metastases among five modes of transplant at days 28 and 40 after tumor inoculation.

Tumor was transferred in 100% of all animals whether inoculated intrarenally, i.v., i.m., i.p., or s.c. The only significant difference was between those receiving intrarenal inoculation and those receiving tumor by any other route. The intrarenal group died very significantly sooner and with less variation, that is, there was a shorter and more precisely reproducible dying time in this group. The growth of the tumor is reproducible both in terms of size and wt of the primary lesion as well as in terms of the distribution and number of metastatic lesions. Androgens and estrogens appear to stimulate metastatic spread. Though electron microscopy revealed particles suggestive of virus, the tumor could not be induced with cell-free extracts. The intrarenal tumor caused polycythemia and high levels of erythroid stimulating factor in the blood, but this appeared to be produced by the damaged host renal tissue.

5802 ONCOLOGICAL CHARACTERISTICS OF MOUSE STRAIN CC57Br. (Rus.) Prokof'eva, O. G. (N. N. Petrov Res. Inst. Oncol., USSR). *Vopr Onkol* 19(8):101-102, 1973.

Observations made on the incidence of spontaneous tumors in a group of line-bred CC57Br mice between 1969 and 1971 showed an increase over those observed previously (from 1943 to 1960). The incidence of lung tumors increased from 0.6% in 1952-1957 to 6.4% in 1969-1971. Most of the lung tumors were malignant adenocarcinomas or papillary cystoadenocarcinomas; only one benign pulmonary adenoma was found. Tumors of the liver and leukemia also occurred more frequently. Tumors were found in previously unreported locations (mammary gland adenocarcinomas, tumors of the theca folliculi and cumulus ovaricus, angiofibromatosis). These findings demonstrate the necessity of monitoring the frequency and location of spontaneous tumors occurring in the low-cancer CC57Br strain of mice.

5803 THYROID HORMONE ACTION IN CELL CULTURE: DEMONSTRATION OF NUCLEAR RECEPTORS IN INTACT CELLS AND ISOLATED NUCLEI. (E.) Samuels, H. H. (New York U. Med. Ctr., N.Y.) and J. S. Tsai. *Proc Natl Acad Sci* 70(12):3488-3492, 1973.

The binding of (125 I)triiodothyronine and purified (125 I)thyroxine to various subcellular components of GH₁ cells after incubation with intact cells in serum-free medium was examined. High-affinity, low-capacity binding sites for the hormones were noted in nuclear but not in mitochondrial or cytosol fractions. Chromatographic analysis of the bound nuclear radioactivity from cells incubated with (125 I)thyroxine showed 97% thyroxine, 1% iodide, and 1% triiodothyronine. Apparent equilibrium dissociation constants were 20pM for triiodothyronine and 260 pM for thyroxine. The maximal binding capacity was identical for both hormones, with about 5000 sites/cell nucleus. Binding with (125 I)thyroxine was competitively inhibited by triiodothyronine. It is suggested that triiodothyronine and thyroxine interact with identical nuclear receptors, and that conversion of thyroxine to triiodothyronine may not be a prerequisite

site for biological activity. When (^{125}I)triiodothyronine was incubated directly with isolated nuclei, similar high-affinity, low-capacity nuclear binding sites were demonstrated. Increasing the concentrations of nonradioactive triiodothyronine caused a subsequent increase in binding when (^{125}I)triiodothyronine was then incubated directly with isolated nuclei, suggesting that nuclear receptors are not fixed, but increase after exposure of intact cells to hormone. This increase in nuclear receptor content may result from the transfer of an unstable cytosol receptor to the nucleus. It is suggested that these high-affinity nuclear binding sites are important in mediating the action of thyroid hormones. The localization of the high-affinity binding to the cell nucleus supports the theory that thyroid hormones modulate gene activity.

- 5804 PROGRAMMING OF CELLS FOR DEATH UNDER DEFINED EXPERIMENTAL CONDITIONS: RELEVANCE TO THE TUMOR PROBLEM. (E.) Basile, D. V. (H. H. Lehman Coll., City U. New York, Bronx), H. N. Wood and A. C. Braun. *Proc Natl Acad Sci USA* 70(11): 3055-3059, 1973.

Cylinders of pith parenchyma from the stems of Romaine lettuce heads were incubated in culture media with indoleacetic acid, kinetin, adenosine 3':5'-cyclic monophosphate (cAMP), 8-bromoadenosine 3':5'-cyclic monophosphate (8-Br-cAMP), theophylline, and/or cytokinesin I. Kinetin, cytokinesin I, and 8-Br-cAMP were all highly effective in encouraging the differentiation of the parenchyma cells into tracheary elements with accompanying cell death. Similar results were obtained with theophylline used in association with cAMP and indoleacetic acid, although the number of tracheary elements formed under these conditions was far less than the number found when the tissues were treated with the first three compounds. Occasional characteristic tracheary elements were observed when theophylline was used in conjunction with indoleacetic acid alone. Although the patterns of tracheary element differentiation in the excised lettuce discs treated with inductive concentrations of kinetin, cytokinesin I, or 8-Br-cAMP were similar, the growth-promoting effects of the three compounds were quite different. The initiation of tracheary element formation was concentration-dependent within narrow limits. These data suggest that cAMP may play an important role in regulating the conversion of parenchyma cells into tracheary elements in this system. The results may have bearing on the problem of tumor control in that, in both plants and animals, tumor cells may retain the potentialities for terminal differentiation with the loss of neoplastic properties.

- 5805 CELL PROLIFERATION IN COLONIC MUCOSA AND CARCINOMA OF THE COLON. (E.) Bottomley, J. P. (U. Leeds, Sch. Med., England) and E. H. Cooper. *Proc R Soc Med* 66(12):35-37, 1973.

Cell production in the normal colon mucosa is limited to the lower half of the crypt, and there is a descending gradient of cell turnover times from the

duodenum to the rectum. The mean cell cycle time in the colonic mucosa varies from species to species. In reaction to the excessive colonic cell loss induced by various noxious agents, the size of the proliferative zone is increased and the time between successive mitoses may be shortened. Thus the presence of mitotic figures in the upper half of the crypt is a sign of an abnormal mucosa. Although colonic and rectal adenomatous polyps resemble normal mucosa, their cells divide at random at any site in the depths or on the surface of the polyp. The doubling times of human colorectal cancers vary between 1155 and 138 days; secondaries growing in the lung have a mean doubling time 5 to 6 times faster than the colonic primaries. If the colonic tumor is slow to metastasize, a relative long life span may result. An indirect, albeit often inaccurate, assessment of the proliferative activity can be obtained by labeling tumor biopsy specimens with ^3H -thymidine. A stathmokinetic method in which cells entering mitosis are arrested in metaphase via injection of the patient with colchicine or vincristine can also be used. In general, the overall proliferative activity of the tumors is less than in the proliferative zones of normal colonic mucosa taken from the same specimen. At least 95% of the daily cell population of the tumor is lost. Little is known of the functional organization of colonic tumor cell populations. Injections of dimethylhydrazine induce adenomatous polyps and adenocarcinomas in mice that closely resemble their counterparts in man. This model can probably be used to examine problems of growth control in polyps and colonic adenocarcinomas and possible for chemotherapy studies.

- 5806 THE CYCLIC AMP CONTENT AND KARYOTYPE OF THE SOMATIC HYBRIDS OF MOUSE MALIGNANT AND NONMALIGNANT CELLS SEGREGATING *IN VIVO* AND *IN VITRO*. (E.) Peytremann, A. (Vanderbilt U. Sch. Med., Nashville, Tenn.) and E. Engel. *Hormone Res* 4(6):340-348, 1973.

The karyotypes and cyclic adenosine 3',5'-monophosphate (cAMP) values of somatic hybrids between malignant (CCL79) and nonmalignant (B82) mouse cells maintained *in vitro* or injected into LAF₁ mice were compared. Six wk after the initial fusion, the hybrid cell lines contained close to the sum of the chromosomes present in both parental lines initially mated; this was also reflected in the chromosome distribution in the hybrids. None of the mice receiving the parental B82 cells developed tumors, 17 of the 24 mice receiving the parental CCL79 cancer cells developed tumors, and 6 of the 72 mice receiving the hybrid cells developed tumors. The clonal chromosome pattern of the tumors induced by the hybrid cells suggested that they arose from very few or even one of the many cells injected into each animal and the malignant resumption occurred only after further *in vivo* karyotypic evolution of the cells. The karyotypic changes in the hybrid cells kept *in vitro* differed from those in the hybrids which had developed into tumors *in vivo*. The cAMP values were lower in the hybrids and the B82 parent than in the CCL79 parent, but there were

no differences between the *in vitro* and *in vivo* segregants. Thus, variations in the cAMP levels do not appear to account for the invasive properties of these cells.

- 5807 PROLIFERATION KINETICS OF MYELOPOIETIC CELLS AND MACROPHAGES IN DIFFUSION CHAMBERS AFTER TREATMENT WITH GRANULOCYTE EXTRACTS (CHALONE). (E.) Laerum, O. D. (Max-Planck-Inst. Virus Res., Tübingen, W. Germany) and H. R. Maurer. *Virchows Arch [Zellpathol]* 14(4):293-305, 1973.

A single injection of partially purified extracts of mature granulocytes into BALB/c mice carrying i.p. diffusion chambers inhibits the progression of myelopoietic cells into DNA synthesis during exponential proliferation. The inhibition leads to a reduced cell yield after 12 hr. Cells in the G₂ and M phases of the cell cycle are not inhibited, but some of the cells which are not arrested in G₁ seem to proceed through S very slowly. When the extracts are made from suspensions of granulocytes contaminated with some macrophages, the proliferation of macrophages in diffusion chambers is also inhibited. Extracts of granulocyte suspensions containing no macrophages showed no such effect. This suggests the existence of different inhibitors for myelopoietic cells and macrophages. The inhibition of cell proliferation by granulocyte extracts is tissue specific for myelopoietic cells. Crude skin extracts inhibiting cells in the G₁ and G₂ phases of the cell cycle in epidermis had no effect on myelopoietic cells in diffusion chambers.

- 5808 FAMILIAL MYELOMA. (E.) Boga, M. (Postgrad. Med. Sch., Semmelweis U. Med. Sch., Budapest, Hungary), J. Jako, J. Doman, E. Magyar and E. Kohyar. *Folia Haematol (Leipzig)* 100(3):201-212, 1973.

Case reports of a mother and son in whom manifest myeloma was diagnosed are presented and compared with 32 previous cases of familial myeloma. Based on these 34 cases, it appears that: the sex distribution for the disease is nearly equal; it tends to occur with advanced age, the average age in these cases being 61 yr; within affected families, the disease develops at the same point in time and may be triggered by the same mechanism; the class of pathological immunoglobulin involved differed for each affected member of a particular family, indicating that the familial predisposition involved pertains to the pathological proliferation of the immunoglobulin producing plasma cell rather than to the actual immunoglobulin class produced; and the familial occurrence may have an underlying genetic basis.

- 5809 THE BEHAVIOUR OF CARCINOMA OF THE LARGE BOWEL IN MAN FOLLOWING TRANSPLANTATION INTO IMMUNE DEPRIVED MICE. (E.) Cobb, L. M. (Chester Beatty Res. Inst., London, England). *Br J Cancer* 28(5):400-411, 1973.

The growth of carcinoma of the human large bowel was

studied in the first two passages in immune deprived CBA/lac mice. The tumors were obtained from large bowel resections on three people. There was a strong histological similarity between the patient's tumor and the tumor that grew subcutaneously in the mice 2-8 months after implantation. One dissimilarity observed was a higher mitotic index in some of the tumors growing in the immune deprived animals. In the second passage of the bowel tumors, cells were implanted into groups of 8-10 animals s.c., i.m., i.v., intrahepatically, i.p., and intrathoracically. Tumor growth was observed in all three tumors when they were implanted s.c., i.m., i.p., and intrathoracically. The infiltration of muscle by the tumors was a frequent finding. Lung metastases developed after the i.v. injection of cells from one of the three tumors. In none of the three tumors did growth follow the injection of cells directly into the substance of the liver. On no occasion were spontaneous metastases observed.

- 5810 THE EFFECTS OF CYTOPLASMIC EXTRACTS ON DNA SYNTHESIS *IN VITRO*. (E.) Thompson, L. R. (Dept. Genetics, U. Washington, Seattle) and B. J. McCarthy. *Biochim Biophys Acta* 331(2):202-213, 1973.

Cytoplasmic extracts were prepared from tumor cells of Swiss Webster mice actively synthesizing DNA. The extracts were added to an *in vitro* DNA-synthesizing system where they increased the rate of DNA synthesis 5-10-fold. No such stimulation was observed when cytoplasm from inactive cells was added. When both types of cytoplasm were added simultaneously, the stimulatory effect was dominant. The stimulating factor was partially purified from cytoplasmic extracts of Taper mouse hepatoma and was a heat-stable cation of low molecular weight. The stimulation occurs at the level of interaction between the DNA polymerase and the DNA template and for stimulation to occur, DNA polymerase, template and the cytoplasmic factor must be present simultaneously. The data consistently suggest that the DNA-stimulating factor promotes the attachment of the enzyme at the template. It is not certain whether the factor operates as a cofactor in the assembly of subunits of DNA polymerase, as an effector of an allosteric change in the enzyme, or is essential for the assembly of the replication complex.

- 5811 CHROMOSOME CHANGES IN CONGENITAL LYMPHOBLASTIC LEUKAEMIA. (E.) Sharp, J. C. (Ctr. Human Genetics, Sheffield, England), A. M. Potter and R. J. Guyer. *Lancet* (7843):1448, 1973.

A case of chromosomal changes is reported in a 6-wk-old patient with congenital lymphoblastic leukemia. Analysis of an uncultured bone marrow sample before treatment revealed a chromosome complement of 45,XY,-2G,-E,+C,+mar in 40 cells examined. Blood taken at the same time and cultured with phytohemagglutinin stimulation had a normal chromosomal complement. Bone marrow examination during remission 3 wk after initiation of chemotherapy revealed no chromosomal abnormalities.

- 5812 FURTHER EVIDENCE AGAINST POST-TRANSCRIPTIONAL CONTROL OF INDUCIBLE TYROSINE AMINOTRANSFERASE SYNTHESIS IN CULTURED HEPATOMA CELLS. (E.) Kenney, F. T. (Carcinogenesis Program, Oak Ridge Natl. Lab., Tenn.), K.-L. Lee, C. D. Stiles and J. E. Fritz. *Nature [New Biol]* 246(155):208-210, 1973.

The question of transcriptional *versus* post-transcriptional control of tyrosine aminotransferase was studied in hydrocortisone-stimulated replicating monolayer hepatoma cell cultures. Enzyme synthesis, as determined by the rate of ^3H -leucine incorporation into protein with aminotransferase activity, was consistently inhibited in stimulated and nonstimulated cells treated with actinomycin D at a concentration (5 $\mu\text{g}/\text{ml}$) unable to effect superinduction but able to block hormone-mediated induction. Measurement of the rate of aminotransferase degradation in actinomycin D-treated preinduced cells confirmed earlier results showing that superinduction by actinomycin D was due to inhibition of this process and was in no way related to cell culture "step down" nutritional conditions. Cordycepin at a concentration (10 $\mu\text{g}/\text{ml}$) which selectively inhibited poly A-containing mRNA synthesis without significantly affecting other mRNA or rRNA synthesis, completely inhibited hydrocortisone induction of enzyme synthesis. These findings are consistent with the view that glucocorticoids induce aminotransferase by inducing enzyme-specific mRNA synthesis and not by inhibiting synthesis of a repressor mRNA moiety.

- 5813 ULTRASTRUCTURAL ORGAN-SPECIFICITY AND POLYMORPHISM OF THE CANCER CELLS. (E.) Raikhlin, N. T. (Inst. Exp. Clinical Oncology, Acad. Med. Sci., Moscow, USSR). *Neoplasma* 20(5):567-578, 1973.

Electron microscope analysis of human thyroid tumors (melanoma, rhabdomyosarcoma, fibrosarcoma, and synovoma) and bladder tumors shows that some cancer cells retain the ultrastructural organization of initial normal cells, i.e., ultrastructural organ-specificity is preserved. Other cancer cells undergo definite changes without any obvious regularity. In different tumors such changes can be different, inconstant, and nonspecific. These peculiarities of the electron microscopic structure of tumor cells suggest a structure-functional rearrangement, rather than dedifferentiation and simplification. The absence of specific ultrastructural changes in cancer cells makes primary diagnosis of tumors by electron microscopy virtually impossible. However, the technique may have value for differential diagnosis, when a tumor's histogenesis organ or tissue assignment is unclear.

- 5814 ELECTRON MICROSCOPIC OBSERVATIONS ON HUMAN GLIOBLASTOMAS AND ASTROCYTOMAS MAINTAINED IN ORGAN CULTURE SYSTEMS. (E.) Sipe, J. C. (Stanford U. Sch. Med., Calif.), M. M. Herman and L. J. Rubinstein. *Am J Pathol* 73(3):589-606, 1973.

The fine structure of four glioblastomas and two

cerebellar astrocytomas maintained in organ culture systems up to 137 days and 43 days, respectively, using either a three-dimensional sponge foam matrix technic or a Millipore filter platform technic, is described and compared. The cells of both tumor types showed increased astrocytic differentiation, characterized by a progressive increase in glial filaments associated with an increase in free ribosomes and granular endoplasmic reticulum. A progressive increase in basement membrane material, presumably originating from explanted endothelial cells or pericytes, was also found in both tumor types and was often associated with increased numbers of collagen fibrils. Astrocytic tumor cell processes frequently preserved their contact with this basement membrane material. Microvascular fenestrations or gaps in endothelial cells were not identified. These electron microscopic features appear to correspond to the early stages of perivascular sclerosis previously noted by light microscopy in gliomas maintained in organ culture systems and are presumably related to the progressive obliteration of the functional microvasculature.

- 5815 MORPHOLOGICAL AND CYTOLOGICAL CHARACTERS OF HUMAN OVARIAN TUMOR IN SHORT TERM TISSUE CULTURES. (E.) Moraru, I. (Inst. Pathol. Genet. "Dr. V. Babes," Bucharest, Romania) and L. Fadei. *Arch Geschwulstforsch* 42(2):163-171, 1973.

Cytogenetic and morphological investigations of human ovarian tumor tissue cultures show the following: The two papillary adenocarcinoma tissue cultures studied are characterized by a wide chromosome number distribution in hyperdiploid and hypertriploid range, resp. They have neither the same modal values nor the same markers. In the tumor various metaphases with particular cytogenetical patterns are found. The cultures grow in a discontinuous monolayer of atypical epithelial-like cells. In the papilocystadenoma tissue cultures diploid metaphase prevail. Near diploid and scarce heteroploid metaphases are also found. The continuous culture monolayer is formed by fibroblast-like cells arranged in whorls and scarce atypical cells. The presence of heteroploid, atypical cells in certain papilocystadenoma tissue cultures suggest the precancerous condition of these tumors.

- 5816 ESTROGEN RECEPTORS IN HUMAN BREAST CANCER. (E.) Leclercq, G. (Jules Bordet Inst., Tumor Ctr. Free U. Brussels, Belgium), J. C. Heuson, R. Schoenfeld, W. H. Matthei and H. J. Tagnon. *Eur J Cancer* 9(9):665-673, 1973.

Samples from 77 primary and 65 metastatic human breast cancers were assayed for specific cytoplasmic estrogen receptors. Cytosol preparations were incubated with increasing amounts of ^3H -estradiol-17 β . The unbound radioactivity was removed by charcoal-coated dextran. Saturable high affinity binding sites were detected in 56% of the primary and 37% of the metastatic tumors. The binding constants of these receptor sites for estradiol were quite variable; most ranged from 1.0 to 20 $\times 10^{-10}\text{M}$, but some were larger

(up to $108 \times 10^{-10}M$). The concentrations of binding sites were distributed within a continuous range from 5 to 1330 femtomoles per mg protein. This wide range was not ascribable only to variations in amounts of contaminating serum proteins. Receptors were detected in only 8% of cytosol preparations containing less than 2 mg protein per ml; in contrast, they were detected in 53% of cases with higher protein concentration. This indicates that at low protein concentration, false negative results are likely to occur. Detectable amounts of receptors were not found in sera or samples from normal mammary gland, nipple, areola, skin, and non-invaded lymph nodes. The reliability of a simplified procedure based on isotopic dilution of the labelled estradiol, to be used with very small tumor tissue samples, was studied. It compared quite well with the other one except in cases of very low concentrations of receptor. No relationship was found between the occurrence of receptor and the age of the patient or the histological type of the tumor. There was also no relationship between the occurrence of receptors in the primary tumor and presence or absence of metastatic axillary lymph nodes. However, when present, the latter had the same characteristics with respect to the receptor as the corresponding primary, with only one exception.

5817 CARCINOMA *IN SITU* OF THE ESOPHAGUS (EARLY ESOPHAGEAL CANCER). A CASE REPORT AND A REVIEW OF THE LITERATURE. (E.) Seifert, E. (Med. Coll., Hannover, W. Germany), H. H. Borst, H. Ostertag, H. St. Stender, M. Braschke, F. Misaki and Z. Atay. *Endoscopy* 5(3):147-153, 1973.

5818 EFFECT OF CORDYCEPIN ON INDUCTION OF TYROSINE AMINOTRANSFERASE EMPLOYING HEPATOMA CELLS IN TISSUE CULTURE. (E.) Butcher, F. R. (U. Wisconsin, McArdle Lab. Cancer Res., Madison), D. E. Bushnell, J. E. Becker and V. R. Potter. *Exp Cell Res* 74:115-123, 1972.

5819 TISSUE CULTURE STUDIES OF CHILDREN'S TUMOURS. (E.) Waghe, M. (Dept. Child Hlth, U. Manchester, England), S. Kumar and J. K. Steward. *J Pathol* 111(2):117-124, 1973.

5820 OVARIAN TUMOURS IN POSTMENOPAUSAL WOMEN. CLINICOPATHOLOGICAL FEATURES AND HORMONAL STUDIES. (E.) Rome, R. M. (Royal Women's Hosp., Melbourne, Australia), C. R. Lavery and J. B. Brown. *J Obstet Gynaecol Br Commw* 80(11):984-991, 1973.

5821 'SCLEROSING HAEMANGIOMA' OF THE LUNG: AN ALTERNATIVE VIEW OF ITS DEVELOPMENT. (E.) Kennedy, A. (Dept. Path., U. Sheffield, England). *J Clin Pathol* 26(10):792-799, 1973.

5822 KAPOSI SARCOMA-LIKE GRANULOMA ON DIAPER DERMATITIS. A REPORT OF FIVE CASES. (E.) Uyeda, K. (Kyoto Profe. Univ. Med., Japan), K. Nakayasu, Y. Takaishi and S. Sotomatsu. *Arch Dermatol* 107(4):605-607, 1973.

5823 INTERCELLULAR JUNCTIONS BETWEEN NOVIKOFF HEPATOMA CELLS AND HEPATIC CELLS. (E.) Tremblay, G. (Fac. Med., Univ. Montreal, Canada) and F. Babai. *Exp Cell Res* 74:355-358, 1972.

5824 LEUKOCYTE ASPARAGINE SYNTHETASE ACTIVITY IN PATIENTS WITH ACUTE LEUKEMIA. (E.) Berezov, T. T. (Dept. Biochem. Patrice Lumumba People's Friendship U., Moscow, USSR) and L. V. Zherdeva. *Biull Eksp Biol Med* 76(11):67-73, 1973.

5825 SARCOMAS OF THE SKELETAL MUSCLES: RHABDOMYOSARCOMAS. (Pol.) Klein, A. (Inst. Oncol., Warsaw, Poland), M. Dabska, J. Adamus, R. Szatkowska and S. Szalc. *Pol Tyg Lek* (3):93-96, 1973.

5826 CHARACTERIZATION OF SUBCELLULAR CONSTITUENTS OF HEPATOMA CULTURED CELLS (HTC CELLS). (E.) Lopez-Saura, P. (Lab. Chem. Physiol., Univ. Louvain, Belgium), P. Tulkens and A. Trouet. *Arch Int Physiol Biochim* 80(5):977-978, 1972.

5827 METASTATIC TUMOUR OF THE INNER EAR: A HISTOPATHOLOGICAL REPORT. (E.) Hoshino, T. (Teikyo U. Sch. Med., Tokyo, Japan), F. Hiraide and Y. Nomura. *J Laryngol Otol* 86(7):697-707, 1972.

5828 TUMOURS OF THE NOSE AND SINUSES. A CLINICO-PATHOLOGICAL STUDY. (E.) Buchanan, G. (Glasgow Royal Infirmary, Scotland) and G. Slavin. *J Laryngol Otol* 86(7):685-696, 1972.

5829 A LIGHT- AND ELECTRON-MICROSCOPIC STUDY OF A TEMPORAL-LOBE GANGLIOGLIOMA. (E.) Rubinstein, L. J. (Stanford U. Sch. Med., Calif.) and M. M. Herman. *J Neurol Sci* 16(1):27-48, 1972.

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5831 A LIVER tRNA FOR THE ASSAY OF RAT LIVER METHYLASE *IN VITRO*. (E.) Rajalakshmi, S. (Temple U. Sch. Med., Philadelphia, Pa.). *Proc Am Assoc Cancer Res* 14 (March):39, 1973.

5832 LIPOSARCOMAS. (Pol.) Chrapowicki, A. (Inst. Oncol., Warsaw, Poland), M. Dabska and J. Adamus. *Pol Tyg Lek* 28(3):88-90, 1973.

- 5833 MALIGNANT MELANOMA IN BILATERAL DERMOID CYSTS OF THE OVARY. (E.) El-Minawi, M. F. (Ellis Fischel State Cancer Hosp., Columbia, Mo.) and J. M. Hori. *Int J Gynaecol Obstet* 11(6): 218-222, 1973.
- 5834 OVARIAN TUMORS WITH FUNCTIONING STROMAL CELLS. CASE REPORT OF A FEMINIZING BRENNER TUMOR. (E.) Nissen, E. D. (Dept. Gynecol. Obstet., U. California, Irvine) and A. I. Goldstein. *Int J Gynaecol Obstet* 11(6):213-217, 1973.
- 5835 CLINICAL FEATURES OF NONFUNCTIONING CHROMOPHOBE ADENOMAS. (E.) Hooper, M. J. (Royal North Shore Hosp., Sydney, Australia), J. N. Stiel, G. Selby, J. M. F. Grant and S. Watters. *Ausg N Z J Med* 3(4):371-376, 1973.
- 5836 *IN VITRO* LEUKOCYTE THYMIDINE UPTAKE IN CHRONIC LYMPHOCYTIC LEUKEMIA. (E.) Sokal, J. E. (Roswell Park Mem. Inst., Buffalo, N.Y.) and R. Lopez-Sandoval. *Proc Am Assoc Cancer Res* 14 (March):41, 1973.
- 5837 PERIPHERAL CYTOPLASMIC CHARACTERISTICS OF LEUKOCYTES IN MONOCYTIC LEUKEMIA: RELATIONSHIP TO CLINICAL MANIFESTATIONS. (E.) Lichtman, M. A. (U. Rochester Sch. Med., N.Y.) and R. I. Weed. *Blood* 40(1):52-61, 1973.
- 5838 REGULATION OF URACIL UTILIZATION FOR RNA SYNTHESIS IN ENRICH ASCITES TUMOUR CELLS BY GLUCOSE METABOLISM. (E.) Itzhaki, S. (Dept. Med. Biochem., U. Manchester, England). *Life Sci (II)* 11(13):649-655, 1972.
- 5839 RELATIONSHIP BETWEEN THE GROWTH OF TUMORS AND TRANSPLANTS FROM THE EMBRYONIC GASTRO-INTESTINAL TRACT AND THE AGE OF RECIPIENT MICE. (Rus.) Tumian, B. G. (Inst. Exp. Clin. Oncol., Moscow, USSR), S. N. Zinzar, G. Ia. Svet-Moldavskii and B. I. Leitina. *Vopr Onkol* 19(3):63-66, 1973.
- 5840 CHARACTERISTIC VARIETY OF CHILDHOOD FIBROMATOSIS (FIBROUS HAMARTOMA). (Rus.) Vikhert, A. M. (Pediatric Clin. Hosp. N. 57, Moscow, USSR), K. K. Poroshin, and G. A. Galil-Ogly. *Arkhi Patol* 35(1):57-62, 1973.
- 5841 ASSOCIATION OF ACUTE MYELOID LEUKEMIA WITH HODGKIN'S DISEASE. (Pol.) Udolf, E. (Mining Hosp., Katowice-Janow, Poland), S. Kosmiderski, J. Krol, J. Labryga and L. Czepiel. *Pol Tyg Lek* 28(32):1238-1239, 1973.
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5429*	5670*	5557*
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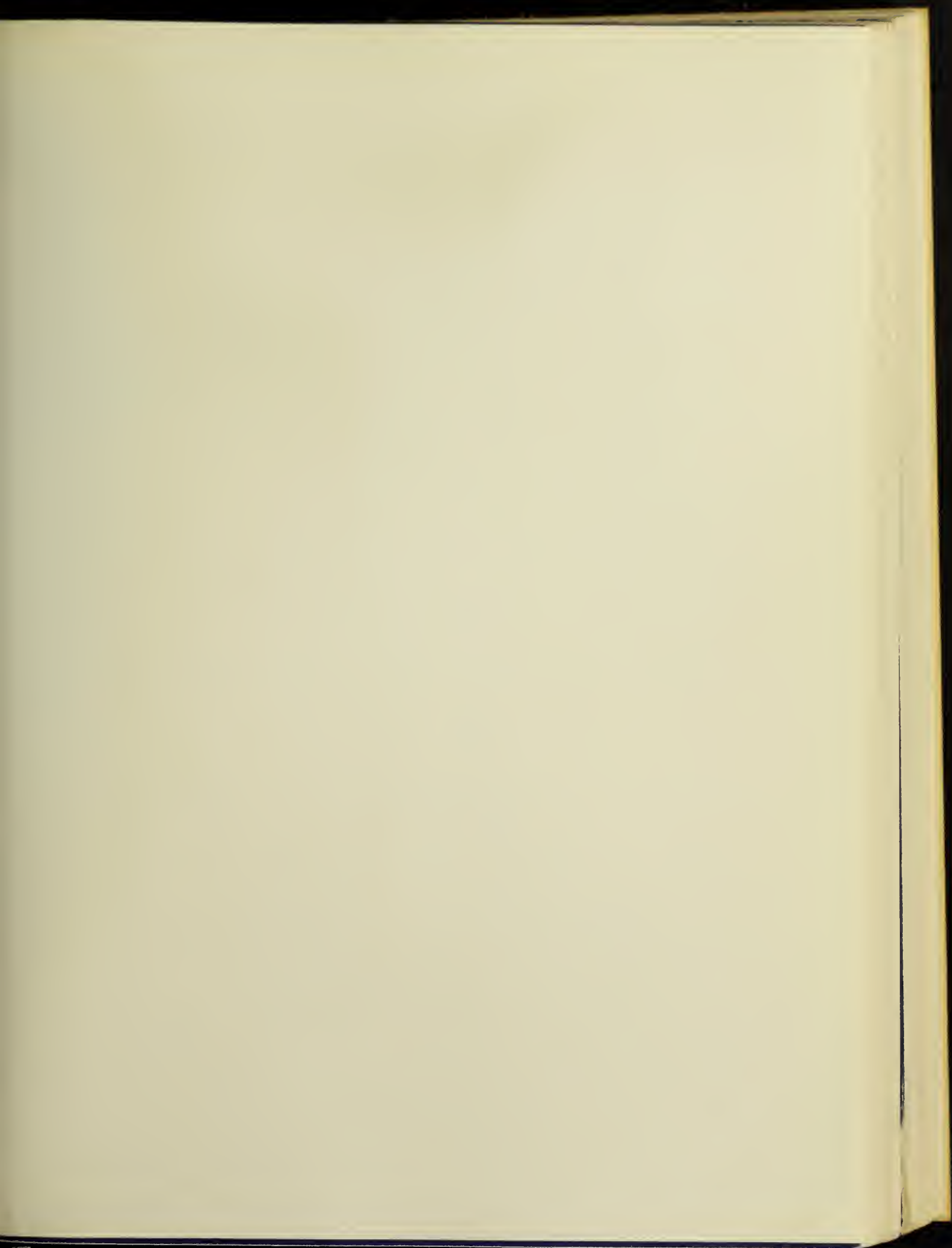
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NOVEMBER 1973

Abstract & Citation Nos. 6001-6600

Vol. 11

No. 11

CARCINOGENESIS ABSTRACTS

National Cancer Institute

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service National Institutes of Health

1. The first part of the book is a history of the city of London, from its foundation to the present time. It is written by a learned and judicious author, and is one of the most valuable works on the subject of the history of London.

CARCINOGENESIS ABSTRACTS

A monthly publication of the

National Cancer Institute

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Literature Selected, Abstracted, and Indexed
by

The Franklin Institute Research Laboratories
Science Information Services
Biomedical Section

Bruce H. Kleinstein, Ph.D., Technical Editor

Contract Number NO1 CP 33309

Public Health Service, USDHEW

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PREFACE

Carcinogenesis Abstracts is a publication of the National Cancer Institute. The journal serves as a vehicle through which current documentation of carcinogenesis research highlights are compiled, condensed, and disseminated on a regular basis. It represents an integral part of the Institute's program of fostering and supporting coordinated research into cancer etiology. Issues of *Carcinogenesis Abstracts* normally contain three-hundred abstracts and three-hundred citations (unaccompanied by corresponding abstracts). Abstracts and citations refer to the current scientific literature that describes the most significant carcinogenesis research carried on at the National Cancer Institute, other governmental agencies, and private institutions. *Carcinogenesis Abstracts* is intended to be a highly useful current awareness tool for scientists engaged in carcinogenesis research or related areas. The great number and diversity of publications relevant to carcinogenesis make imperative the availability of this service to investigators whose work requires that they keep abreast with current developments in the field.

Carcinogenesis Abstracts is normally published monthly. Volume XI covers the scientific literature published from Jan 1973 through Dec 1973. A cumulative subject and author index for Volume XI will be published shortly after the final regular issue. The first issue of Volume XI which would normally be dated July 1972 is being dated July 1972 - January 1973. This change is being made so that the date of publication of material included in each issue corresponds to the issue date. This journal is available free of charge to libraries and to individuals who have a professional interest in carcinogenesis. Requests for *Carcinogenesis Abstracts* from qualified individuals should include statements of their relationship to carcinogenesis research. All correspondence should be addressed as follows.

Carcinogenesis Abstracts
Room C-325
Landow Building
National Cancer Institute
National Institutes of Health
Bethesda, Maryland 20014

Use of Funds for Printing this publication
approved by the Director of the Bureau of
the Budget on July 25, 1967.

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LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
ln.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotrophic hormone	mg	milligram(s)
ADP	adenosine diphosphate	min	minute(s)
AMP	adenosine monophosphate	ml	milliliter(s)
ATP	adenosine triphosphate	mm	millimeter(s)
C	degrees centigrade	MTD	maximum tolerated dose
cm	centimeter(s)	ng	nanogram (10^{-9})
CNS	central nervous system	pg	picogram (10^{-12})
cpm	counts per minute	p.o.	orally
DNA	deoxyribonucleic acid	ppm	parts per million
e.g.	for example	r	Roentgen
g	gram(s)	RBC	red blood cells (erythrocytes), red blood count
µg	microgram(s)	resp.	respectively
hr	hour(s)	RNA	ribonucleic acid
i.m.	intramuscular	s.c.	subcutaneous
i.p.	intraperitoneal	sec	second(s)
IU	international unit(s)	U	unit(s)
i.v.	intravenous	UV	ultraviolet
kg	kilogram(s)	WBC	white blood cells (leukocytes), white blood count
LD ₅₀	median lethal dose(s)	wk	week(s)
m	meter(s)	wt	weight(s)
M	molar	yr	year(s)
mEq	milliequivalent(s)		
mM	millimolar		
µM	micromolar		
mC, µC	milli-, microcurie(s)		

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- 6001 MALIGNANT TUMORS DEVELOPING DURING IMMUNOSUPPRESSIVE THERAPY: A NEW PROBLEM IN THE RECIPIENTS OF TRANSPLANTS. (Ger.) Enderlin, F. (Cantonal Hosp., Basel, Switzerland) and Y. Guisan. *Helv Chir Acta* 40(5/6):773-776, 1973.

In Basel, 3 of 65 transplant recipients (4.6%) developed malignant tumors. A 47 yr-old woman who had received a kidney transplant almost five yr before and who never had any immunological problems developed a carcinoma of the skin which was removed surgically. Histological examination of the tumors showed it was an infiltrating spinalioma. A 33-yr-old woman with a kidney transplant required long-term azathioprine therapy, but the drug had to be discontinued after two yr because the patient developed intolerance. Prednisone and antilymphocyte globulin retarded chronic rejection which had developed, but a final crisis necessitated nephrectomy. The patient became jaundiced and died four wk later; autopsy revealed a multicentric reticulum cell sarcoma of the liver. Five months after receiving a kidney transplant, a 46-yr-old woman developed miliary tuberculosis complicated by personality changes and neurological symptoms. After her unexpected death from respiratory failure, a perivascular round-cell sarcoma was found in the brain. Because of the tendency of recipients of organ transplants to develop malignant tumors, it is recommended that no organs from cancer patients be used as transplants, that cancer patients be excluded from transplant programs, that recipients of organ transplants be followed carefully, and that metastatic or multicentric malignancies which do develop in transplant recipients be treated surgically or with radiotherapy. (4 references)

- 6002 THE ROLE OF THE POLYAMINES, PUTRESCINE, SPERMIDINE, AND SPERMINE IN NORMAL AND MALIGNANT TISSUES. (E.) Russell, D. H. (U. Arizona Med. Ctr., Tucson). *Life Sci* 13(12):1635-1647, 1973.

Interest in polyamines, putrescine, spermidine, and spermine has gained new impetus in the last few years due to the repeated observation that the biosynthesis and accumulation of the polyamines appears to be a universal prerequisite for growth. There is evidence that the polyamines play a role in cell division as well as in protein synthesis, and ornithine decarboxylase, the enzyme catalyzing the formation of putrescine, appears to have an important function in growth processes. Several studies have shown that polyamines enhance the *in vivo* activity of RNA polymerase I, the enzyme responsible for rRNA synthesis. In general, tumor cells accumulate high polyamine concentrations, particularly spermidine, so that they exhibit a relatively high ratio of spermidine to spermine. Those drugs which have clinical significance for the treatment of human tumors lead to decreases in the ability of a tumor to accumulate polyamines in an animal system. Furthermore, putrescine, spermidine, and sometimes spermine have been found to be elevated in the urine of diagnosed cancer patients; cancer patients may also have elevated serum levels of spermidine and putrescine. Animal model studies on a rapidly growing rat hepatoma

following 5-fluorouracil administration indicate that there is a rapid elevation of serum spermidine which correlates with the rapid diminution of tumor spermidine. The routine evaluation of polyamine metabolism in tumor patients may add a new tool to assist in the design of effective chemotherapy. (38 references)

- 6003 CURRENT CONCEPTS OF HERPESVIRUS INFECTION IN THE WOMAN. (E.) Amstey, M. S. (U. Rochester Sch. Med. and Dentistry, N. Y.). *Am J Obstet Gynecol* 117(5):717-725, 1973.

Herpesvirus is the most common viral disease in gynecology. Human herpesviruses are divided into two antigenic subgroups which differ in biochemical and biophysical makeup; type II causes most herpesvirus related genital infections, while type I causes most infections involving the oral mucosa, cornea, and brain. Primary herpesvirus infection is generally caused by venereal contact, but recurrent infections can occur without any contact. Asymptomatic infections can occur on the cervix and high on the vagina. Genital herpesvirus infection is frequently associated with other venereal diseases, particularly gonorrhea, and it presents significantly great problems when occurring in late pregnancy. The infection produces more severe symptoms in pregnancy, and babies of infected women can be infected via contact with herpesvirus in the maternal genital tract during delivery. While less than half of the neonates born to infected women appear to be at risk, infected patients should be delivered at term by cesarean section. There is some evidence that herpesvirus infection is associated with spontaneous abortions and congenital anomalies. In addition, there is a definite epidemiologic relationship between herpesvirus infection and cervical cancer, although an etiologic relationship has not been demonstrated. The possibility that atypical cells are more susceptible to herpesvirus infection may explain the association between cervical atypias and neoplasias and cervical herpesvirus infection. Attempts at treating herpes vulvitis have been uniformly poor. Repeated vaccination with vaccinia virus has been used with varying success in the treatment of such infections, as have the antimetabolites iododeoxyuridine, cytosine arabinoside, and adenosine arabinoside. More uniform success has been achieved with photoinactivation of the virus using neutral red, proflavine, and toluidine blue and with vaccination with bacillus Calmette-Guerin. (67 references)

- 6004 BIOLOGICAL EFFECTS OF LOW DOSES OF RADIATION ON MAN. (Fr.) Goutier, R. (Dept. Radiobiol., Ctr. Study Nuclear Energy, Liege, Belgium). *Electricite* (156):9-14, 1973.

Statistics for the average per capita annual exposure to radiation in the USA show that that produced by nuclear energy is very small (0.003 millirems/yr). While background radiation may play a role in carcinogenesis, chemical and environmental factors are also involved. It is generally accepted that more than

half of all human cancers are chemically induced. The establishment of threshold doses for radiation-induced cancers is rendered difficult since (1) radiation-induced cancers are identical to spontaneous cancers, (2) these cancers only develop after a long latent period so that prolonged observations must be made and (3) the inherent risk with small doses of radiation is so small that very large populations must be studied. Opinions on the carcinogenic action of fetal irradiation conflict. Because of the high radiosensitivity of germ cells and fetal cells, the genetic effect of radiation may be most important. However, radiation-induced genetic damage has been estimated to account for only 1/1000 of the natural incidence. (16 references)

6005 SOME HYPERPLASTIC PROCESSES IN THE ENDOMETRIUM: TERMINOLOGY AND TACTICS FOR THE PHYSICIAN. (Rus.) Zhelezov, B. I. (No affiliation). *Akusherstvo Ginekol* (5):1-7, 1973.

While there is no basis for classifying nonadenomatous polyps or basal hyperplasia of the uterine mucosa among precancerous states, there are conflicting opinions about whether glandular hyperplasia is precancerous. Many investigators have not found an association between nonadenomatous glandular-cystic hyperplasia and uterine cancer, but others believe these conditions are precancerous in postmenopausal women and, when they recur after curettage or unsuccessful hormone therapy, in younger women. According to the author's investigations, uterine cancer is not associated with glandular hyperplasia at all, but endometrial proliferation, secretion, and defective secretion were found in 24% and atrophy in more than half of the cases of uterine cancer studied. Atypical or adenomatous hyperplasia, localized adenomatosis, and adenomatous polyps are precancerous and are considered by some to be identical with endometrial carcinoma *in situ*, but in contrast to uterine cancer, they respond to nonsurgical methods of treatment, particularly in younger patients. Synthetic progestins have given satisfactory results in most patients without sclerocystic ovaries or ovarian tumors. In patients with these conditions, wedge resection of both ovaries gives good results. Diagnostic curettage should be performed at intervals on patients for whom progestin therapy is contraindicated or unsuccessful. Hysterectomy may be justified in older women. (27 references)

6006 CANCER IMMUNOBIOLOGY. (Ger.) Oettgen, H. F. (Sloan-Kettering Inst. Cancer Res., New York, N.Y.). *Arch Klin Exp Ohren Nasen Kehlkopfheilkd* 205(1):21-36, 1973.

Spontaneous regression of cancer, long-term survival of patients in apparent equilibrium with their tumors and the favorable prognosis associated with infiltrations of lymphocytes, plasma cells and macrophages in breast cancer suggest that immune mechanisms protect against or retard tumor growth. Conversely, there is a high incidence of malignancies in clinical syndromes characterized by immune de-

pression and in patients receiving immunosuppressants. Serological techniques have been employed to detect tumor antigen associated with Burkitt's lymphoma. Patients with Burkitt's lymphoma, nasopharyngeal carcinoma and infectious mononucleosis have high antibody titers to Epstein Barr virus (EBV). This does not necessarily mean that EBV causes Burkitt's lymphoma and nasopharyngeal carcinoma since there is no definite evidence that EBV is oncogenic. Other factors, e.g. chronic holoendemic malaria, may be involved as cofactors in carcinogenesis. Alternatively, EBV may exist in different subtypes which are responsible for the various diseases with which it is associated, or it may be a completely innocuous virus present in the lymphatic tissues. Serological techniques have identified other antigens which are associated with malignant melanomas or sarcomas and "fetal antigens" which are found in association with carcinomas of the liver, testes, ovaries and colon. Animal experiments have demonstrated that delayed hypersensitivity reactions can be equated with cellular immunity to tumor antigens. This has made it possible to develop tests to determine how cancer patients are responding to therapy. Recent evidence indicates that immunological enhancement, which has been demonstrated in animals, also occurs in man, indicating that antibodies have an important effect on tumor growth. Tumor cells can continue to grow in apparently immune hosts by two different mechanisms: immune selection and antigen modulation. Immunological methods of treating cancer are considered. (8 references)

6007 A REVIEW: BIOCHEMICAL ALTERATIONS ASSOCIATED WITH MOUSE SPLEEN CELLS INFECTED WITH FRIEND VIRUS. (E.) Munson, B. R. (Roswell Pk. Mem. Inst., Springville, N.Y.) and R. J. Fiel. *J Med (Basel)* 4(6):354-370, 1973.

Biochemical alterations in mouse spleen cells which have been infected with the RNA oncogenic Friend virus (FV) are reviewed. Various studies have indicated that FV infection induces an increase in protein synthesis early in the infection, with a decrease later in the infection. The spleens of FV-infected animals show increased heme synthesis and phosphorus uptake, the latter being independent of spleen enlargement. Cellular DNA is required for the growth of FV in the early phases of infection, and there is a general increase in metabolic activity even during the period prior to overt splenomegaly. The optimum pH and divalent cation conditions of RNA synthesis in normal and infected cells are different at 25 C than at 37 C. There is an increase in RNA synthesis following infection with FV at both low and high ionic strength, while the nuclease activities in infected mice decrease rapidly within a few days after infection. The deoxyribonuclease activity was shown to decrease 70-80% within the first three days after infection and return to near normal levels by the 12th day; the ribonuclease activity decreased more slowly and did not return to normal levels at 12 days. In addition, there is a marked change in the subcellular distribution of RNase, but not DNase, activity. The indication is that there is twice as much enzyme in the infected system as in the uninfected system.

RNA-dependent RNA polymerase solubilized from normal and FV-infected mouse spleen has opposite DNA template preferences; the enzyme from normal spleen prefers heat-denatured DNA, while the enzyme from FV-infected spleen prefers native DNA. Further, whereas the normal spleen contains a high concentration of RNase A, the virus-infected spleen preparation contains very little, if any, RNase A. As compared with normal tissue, FV-infected tissue contains much larger amounts of an enzyme which destroys the RNA product in a DNA-RNA hybrid produced when RNA is synthesized on denatured DNA. Thus, while the leukemic preparation synthesizes RNA on denatured DNA, it cannot be measured because the RNase H degrades it very rapidly. (30 references)

008 IMMUNOCHEMICAL STUDIES OF CARCINOEMBRYONIC ANTIGENS: METHODOLOGIC CONSIDERATIONS AND SOME CLINICAL IMPLICATIONS. (E.) Kupchik, H. Z. (Boston City Hosp., Mass.), N. Zamcheck and C. A. Garavito. *J Natl Cancer Inst* 51(6):1741-1749, 1973.

Several serum and plasma assays for carcinoembryonic antigen (CEA) are summarized and discussed in relation to the various methods and reagents used. The original clinical investigation indicated a specificity of the Farr radioimmunoassay for gastrointestinal cancer. However, elevated levels of CEA have since been seen in non-gastrointestinal malignancies and some nonmalignant diseases using different CEA and anti-CEA antibody preparations and different techniques. Despite the different systems used, the findings in patients have been similar. Tests for detection of CEA in blood are influenced by various factors, such as: 1) non-CEA or CEA-like substances may affect the assays either by immunologic cross-reaction or by nonspecific inhibition of the immunologic reaction; 2) immunochemical characteristics of the antigens and antisera used depend on the preparative procedures; 3) circulating anti-CEA antibodies may bind circulating CEA; 4) contamination or cross-reaction with blood group antigens may influence results; and 5) the definition of "normal" varies with different methods and in different laboratories. (72 references)

009 THE POSSIBLE ROLE OF THE ADENYL CYCLASE SYSTEM AND CYCLIC ADENOSINE MONOPHOSPHATE IN THE CARCINOGENIC PROCESS. (Pol.) Jedrzejczak, W. (Warsaw Med. Academy, Poland). *Przegląd Lekarski* 30(3):316-320, 1973.

A hypothesis is advanced according to which the influence of one cell over the other is mediated through the adenylyl cyclase system. The function of this system is the inhibition, in certain cells, of processes already initiated in neighboring cells. In the normal state, adenylyl cyclase, together with the receptor, is an integral part of the cell membrane. In response to the action of hormones and other environmental factors and with the participation of Mg^{++} and Ca^{++} ions it catalyzes the formation of cAMP from ATP. The cAMP in the presence of the same ions activates a number of protein kinases, affects transcription and influences cell metabolism.

The specificity of the receptor and amount of still active genomes decrease with distance of the cell from the parent zygote. In such a system cAMP acts as an activator of the repressor of different genes. In mature cells it acts as a stabilizer of the repressor system. A certain number of genomes (which decreases with decreasing cell differentiation) is not inhibited. The cAMP acts as a regulator of function probably through phosphorylation of histones. Disturbances in any stage of the adenylyl cyclase system such as blocking of receptor, destruction or inhibition of adenylyl cyclase, inability to utilize cAMP, excessive activity of diphosphoesterase would cause a decrease or suppression of cAMP's repressor function and thus a lack of control over cell division resulting in neoplasia. To prove this hypothesis it would be necessary to 1) detect the existence of cAMP dependent systems which regulate the transcription and replication of DNA; 2) determine the effectiveness of "substitutional addition" of cAMP or its derivatives to inhibit excessive cell division of neoplastic cells *in vitro*; 3) detect a decrease in adenylyl cyclase activity and decrease level of cAMP in malignant cells or prove that a malignant cell is incapable of reacting to endogenous cAMP. (30 references)

6010 CAUSAL GENESIS OF MALIGNANT TUMORS. (Ger.) Schmähli, D. (German Cancer Res. Ctr., Heidelberg). *Arch Klin Exp Ohren Nasen Kehlkopfheilkd* 205(1):1-20, 1973.

The role of chemicals in carcinogenesis has been demonstrated by occupational, epidemiological and toxicological studies which have shown that the incidence of certain types of cancer is related to environmental factors or customs. The latter include betel nut chewing which has been implicated in oral cancer in Asia, sexual hygiene in cervical and uterine cancer in Africa and climate in esophageal cancer in Iran. From the toxicological standpoint, chemical carcinogens can be grouped into those which act locally and those which act after absorption. The oral mucosa is more resistant than the skin to hydrocarbon carcinogens since the saliva dilutes the carcinogen and mucus in the saliva forms a protective barrier, preventing the carcinogen from coming into contact with the oral mucosa. Among drugs which cause cancer in animals are alkylating agents used in cancer chemotherapy and autoimmune diseases and isoniazid. Naturally occurring substances which induce cancer in animals are mycotoxins in foods and cycasin in cycad nuts eaten in Guam; the latter also has a diaplacental carcinogenic action. Nitrosamides also produce tumors of the central and peripheral nervous systems in the offspring of rats given these compounds during pregnancy. Since neurogenic tumors are relatively common in children and adolescents, they may have been induced before birth by exposure of the mother to carcinogens. Two noncarcinogens, e.g. ethylurea and sodium nitrite, may react in the mother's body to form a carcinogen (ethylnitrosourea) which causes cancer in the offspring. A marked increase in the incidence of cancer in children also suggests that some malignancies found in elder-

ly patients may have been induced *in utero*. The immune system plays a role in carcinogenesis and tumor growth. This has been demonstrated by the development of tumors (lymphomas, reticulum cell sarcomas, solid cancers) in 1-6% of recipients of organ transplants which showed no evidence of tumor nodules at transplantation. These recipients had all been given immunosuppressants to prevent transplant rejection. In animals, immunosuppression did promote the growth of transplanted tumors but had no effect on growth of tumors induced by chemical carcinogens. It may be that immunosuppression awakens "sleeping" cancer cells in the body or that immunosuppression *per se* has a carcinogenic action. The latter hypothesis is supported by the high incidence of malignant neoplasms, particularly malignant lymphomas, in children with immune defects. Exposure to very small doses of several carcinogens may result in the development of cancer due to the additive action of the carcinogens. Tumors which can be induced in the ears, nose and throat of rats are described. These include squamous cell carcinoma which can be induced in the auditory canals of 95% of rats treated with 4-dimethylaminostilbene (1-2 mg/kg/day p.o.; latent time one yr). Carcinomas of the ethmoid sinus can be induced in 60% of rats given s.c. injections of N-nitrosopiperidine (100 mg/kg every other wk; latent time one yr) or by making them inhale dimethylnitrosamine (2-4 mg/kg twice a wk; latent time 400 days). Cancers of the paranasal sinuses and, in some cases, pharynx can be induced in rats which inhale methylvinyl nitrosamine (1-2 mg/kg twice a wk; latent time about 300 days). (26 references)

- 6011 INCIDENCE OF CANCER IN SUBJECTS WITH CONGENITAL AND ACQUIRED CHROMOSOME ABERRATIONS. (It.) Koller, P. C. (U. London, England). *Recent Prog Med (Roma)* 54(5):383-395, 1973.

The hypothesis that chromosome anomalies predispose to tumor development has been verified experimentally by s.c. injection of mice with mouse embryonic fibroblasts which had undergone chromosome changes in tissue culture. These mice developed sarcomas. Chromosome anomalies precede development of malignant hepatomas in rats fed p-dimethylaminoazobenzene. In man, chromosome anomalies found in Down's syndrome, Klinefelter's syndrome and Turner's syndrome are associated with an increase in the incidence of leukemia, male breast cancer and ovarian carcinoma, resp. Patients with chromosomes mosaicism also develop malignancies (leukemia, seminomas, endometrial adenocarcinomas, reticulum cell sarcomas, bronchogenic carcinomas). A large-scale study in Edinburgh demonstrated that chromosome anomalies are found more frequently in cancer patients (0.91/1000) than in normal adults (0.30/1000) or newborns (0.13/1000). Skin fibroblasts from patients with Down's syndrome are 50 times more sensitive to malignant transformation induced by SV40 than are normal fibroblasts. Similar results have been obtained with skin fibroblasts from patients with Fanconi's syndrome and a patient with lung cancer, Klinefelter's syndrome and an XY/XXY mosaic. It has been hypothesized that a chromosome aberration may be a phenotypical manifesta-

tation of cellular instability caused by genetic or environmental factors. The role of environmental factors is evidenced by chromosome aberrations found in subjects who later develop myeloblastic leukemia as a result of exposure to benzene. This suggests that chromosome anomalies may also be considered as a manifestation of changes in cellular metabolism which precede the process of carcinogenesis. (36 references)

- 6012 THE PHILADELPHIA CHROMOSOME. (E.) Baserga, A. (Dept. Internal Med. U. Ferrara, Italy) and G. L. Castoldi. *Biomedicine* 18(2):89-94, 1973.

The Philadelphia chromosome (Ph¹) represents a marker in most cases of chronic myelogenous leukemia (CML). However, some CML variants (e.g., the forms in young children, the form of CML characterized by mature polymorphonuclear cells, and the eosinophilic forms) are generally characterized by the absence of Ph¹. In adults, there are two distinct types of myeloid leukemia, Ph¹-positive and Ph¹-negative, the latter being characterized by a more severe evolution and by a reduction in the median survival time as compared with the classical forms of the disorder. Quinacrine fluorescence studies and banding procedures have demonstrated that the Ph¹ belongs to the longer pair of the G group chromosomes and that the extra chromosome in Down's syndrome belongs to the shorter pair of the G group. Although the levels of leucocyte alkaline phosphatase are generally high in Down's syndrome and generally low in CML, the fact that the Ph¹ chromosome belongs to a different pair than that involved in Down's syndrome indicates that the G chromosomes are not associated with the genic regulation of leucocyte alkaline phosphatase. The Ph¹ may arise as a consequence of a monomutational event in undifferentiated cells, but it is difficult to define the etiopathogenic role played by this abnormality in the development of the disease. (48 references)

- 6013 PRECURSORS OF MALIGNANT INTRATHORACIC TUMORS. (Fr.) Le Brigand, H. (Marie Lannelongue Surgery Ctr., Paris, France). *Helv Chir Acta* 40(5/6):621-633, 1973.

Although many investigators have implicated asbestosis in the development of pleural tumors, the author has only been able to demonstrate the presence of asbestos fibers with a light microscope in one operated patient in a three-yr period. Asbestosis was also demonstrated in several operated patients who were later found to have been employed in occupations where they were exposed to asbestos. While asbestosis has been diagnosed in patients with localized fibrous plaques, these lesions do not undergo malignant transformation and are not found in patients with mesotheliomas. It is difficult to distinguish between benign and malignant carcinoids of the trachea and bronchi. There is no correlation between the size of the tumor and its malignancy, and enlarged lymph nodes may simply be a sign of inflammation rather than tumor invasion. The author

found lymph nodes involved in only 8 of 81 (10%) carcinoids, but only three of these tumors slowly developed as malignant tumors and metastasized to the liver. While carcinoids can resemble undifferentiated oatcell carcinomas, carcinoids never undergo transformation to these undifferentiated tumors. Invasive thymomas can infiltrate all the subpleural tissue and may resemble mesotheliomas. In a series of 125 operated patients with thymus tumors, 10 tumors were found histologically malignant, 47 were benign with no recurrences and 31 were invasive. Since very small invasive thymomas have been found, it is thought that benign thymomas can become invasive very early in their development. It is recommended that patients with round opacities in the pulmonary parenchyma undergo exploratory laparotomy to determine whether these lesions are benign or malignant. In three veterans of World War I, carcinomas of the small peripheral bronchi were found in contact with small metal fragments which had been lodged in the lung for years. There is not necessarily a cause-and-effect relationship in these cases. Epithelial carcinomas also developed in three tubercular patients who had chronic pleural fistulas to drain pus from the thorax. It is possible that the epithelium of the fistula underwent degeneration because of irritation from the rubber drains. (8 references)

- 6014 ADENOVIRUS-ASSOCIATED (SATELLITE) VIRUSES. (E.) Henry, C. J. (Allegheny Gen. Hosp., Pittsburgh, Pa.). *Prog Exp Tumor Res* 18:273-293, 1973.

Some of the general characteristics of the adeno-associated viruses are discussed in terms of physical-chemical characteristics, 'helper' viruses, the effects of the adeno-associated viruses on helper viruses, the effect of interferon on the adeno-associated viruses, and the defective nature of the adeno-associated viruses. Despite the considerable knowledge which has been gained concerning these viruses, it is not known whether or not they cause disease in man. Based on the discovery that the herpes viruses are helpers for adeno-associated virus-FA antigen synthesis, the study of adeno-associated virus seroconversion in patients with herpes infections is recommended. (60 references)

- 6015 CHRONIC OSTEITIS AND SKIN ULCERS AS PRE-CANCEROUS CONDITIONS. (Ger.) Burri, C. (Dept. Surg., U. Ulm, Germany) and A. S. Nadjafi. *Helv Chir Acta* 40(5/6):809-814, 1973.

A 74-yr-old man with a 54-yr history of chronic osteomyelitis and recurrent fistulas in the pre-tibial area of the right leg developed a fistular carcinoma of the tibia. Since the patient refused to have his leg amputated, the tumor was excised and the affected bone subjected to curettage. The bone defect was then filled with autologous spongiosa and soft tissue repaired by plastic surgery. Despite good short-term results, the patient died two yr later of a local recurrence and massive metastases. A 76-yr-old woman with a 20-yr history of an indolent ulcer above the internal malleolus was treated conservatively but, in the course of a few weeks, de-

veloped rapidly spreading necrosis, erosion and pain. Since the lesion failed to respond to conservative therapy, a biopsy was taken. This showed that a squamous cell carcinoma had developed from the ulcer. The patient's lower leg was amputated and she is able to walk with the help of a prosthesis six months after surgery. On the basis of literature reports and these two cases, it is concluded that ulcers of the extremities and chronic osteomyelitis should be regarded as precancerous conditions. (20 references)

- 6016 MAMMARY NEOPLASIA IN MICE. (E.) Nandi, S. (Dept. Zool., U. California, Berkeley) and C. M. McGrath. *Adv Cancer Res* 17:353-414, 1973.

Past literature relating to the study of spontaneous mammary tumors in mice is summarized briefly, with more recent discoveries being covered in greater detail. Included are sections on inbred mouse strains, neoplastic and preneoplastic lesions, hormonal influences on murine mammary neoplasia, and the susceptibility and resistance to mammary tumorigenesis showed by susceptible and resistant mouse strains. A section on mammary tumor virus (MTV) covers MTV variants, MTV particles, MTV antigens, the detection and distribution of MTV, the effect of MTV and host influences on the virus, the replication and transmission of MTV, the fate of MTV, and the MTV cycle and the role of B particles. (424 references)

- 6017 GINGIVAL RECESSION ("GETTING LONG IN THE TOOTH"). COLORECTAL CANCER. DEGENERATIVE AND MALIGNANT CHANGES AS ERRORS OF GROWTH-CONTROL. (E.) Burch, P. R. J. (U. Leeds, Gen. Infirmary, Great Britain), D. Jackson, C. G. Fairpo and J. J. Murray. *Mech Ageing Devel* 2(4-5):251-273, 1973.

A unified autoaggressive theory of growth and age-dependent disease is put forth which holds that many disorders result from spontaneous somatic mutations in the central part of the homeostatic system which, under normal physiological conditions, regulates growth and maintains the size of the body. Mutant growth-control stem cells propagate forbidden clones of descendant cells that carry the defects of their progenitors; these cells, or their secreted humoral products, attack complementary target cells at one or more anatomical sites. A survey of the age-specific prevalence of gingival recession in northeastern England indicated that some attacks at left/right homologous teeth affect only one tooth (unilateral), while others affect both teeth (bilateral). The prevalence of unilateral and bilateral attacks of gingival recession as a function of age is consistent with the autoaggressive theory and inconsistent with other theories of aging. At least three distinctive forms of colorectal cancer can be delineated clinically and via age-dependence analysis. Statistics for colorectal cancer in patients with familial intestinal polyposis offer strong support for the view that the mechanisms which initiate malignant change are fundamentally

similar to those which initiate nonmalignant, degenerative change. (33 references)

- 6018 TUMORAL CALCINOSIS IN PAPUA NEW GUINEA. (E.) Wilkey, I. S. (State Health Lab., Brisbane, Australia). *Med J Aust* 2(14):685-687, 1973.

Tumoral calcinosis is an unusual condition characterized by the presence of a calcified tumor in s.c. tissue, most commonly occurring near the hip. Lesions of this type were seen in 27 Melanesian patients in Papua, New Guinea, between 1969 and 1972. In most cases, the lesions were solitary, although there were two cases of bilateral lesions and one of multiple lesions. All of the patients were adults and 19 were female. The lesions were treated by simple excision. The tumors were usually oval in shape and well circumscribed; occasionally they appeared encapsulated and some were lobulated. Microscopic examination revealed calcified material with septa of collagenous fibrous tissue. Small numbers of chronic inflammatory cells were seen, and some tumors contained foreign body giant cells, histocytes, and/or a small focus of new bone formation. Tumoral calcinosis appears to be the result of calcification and scarring of fat necrosis and hematoma which, in turn, results from a single episode of trauma to fatty tissue or from chronic trauma caused by practices such as sleeping on hard surface or carrying loads in unusual manners. (7 references)

- 6019 GYNAECOLOGICAL CANCER IN YOUNG WOMEN. (E.) Daw, E. (Dept. Obstet. Gynaecol., U. Dundee, Scotland). *Br J Clin Pract* 27(12):443-444, 1973. (11 references)

- 6020 CANCER 1974: AN ANALYTICAL VADEMECUM OF ONCOLOGIC RELEVANCE. (E.) De Carvalho, S. (Belmont Med. Clin., Bellflower, Calif.). *Oncology* 28(4):289-298, 1973. (56 references)

- 6021 RENAL CELL CARCINOMA IN CHILDREN: A REPORT OF FOUR CASES AND A REVIEW OF THE LITERATURE. (E.) Lynne, C. M. (U. Miami Sch. Med., Fla.) and S. Machiz. *J Pediatr Surg* 8(6):925-929, 1973. (13 references)

- 6022 HODGKIN'S DISEASE OR MALIGNANT LYMPHOGRANULOMATOSIS IN CHILDREN. (Fr.) Teillet, F. (Louis Mourier Hosp., Colombes, France). *Rev Pediatr* 9(7):433-438, 1973. (8 references)

- 6023 IMMUNOLOGICAL INTERACTIONS IN TUMOR GROWTH. (Sp.) Saal, F. (Natl. Acad. Med., Buenos Aires, Argentina), M. E. M. Colmerauer, L. Rumi and C. Dosne Pasqualini. *Sangre (Barc)* 18(1):9-14, 1973. (5 references)

- 6024 VIRUSES AND TUMORS. (Dut.) Pauw, W. (Virus Lab., U. Amsterdam, The Netherlands) and J. van der Noordaa. *Ned Tijdschr Geneesk* 117(34):1277-1281, 1973. (11 references)

- 6025 CAUSES OF CARCINOMA OF THE BLADDER. (Dut.) Fokkens, W. (Rotterdam Inst. Radiother., Netherlands). *Ned Tijdschr Geneesk* 117(29):1088-1094, 1973. (11 references)

- 6026 STRUCTURE AND REPLICATION OF MOUSE ONCORNA VIRUSES. (Pol.) Dus, D. (Pomeranian Acad. Med., Wroclaw, Poland). *Post Hig Med Dosw* 26(6):751-771, 1972. (105 references)

- 6027 THE ENIGMA OF VIRAL WARTS. (E.) Gold, S. (St. George's Hosp., London, England). *Practitioner* 211(1265):583-592, 1973. (10 references)

- 6028 PROMYELOCYTIC LEUKEMIA. (Fr.) Bernard, J. (No affiliation) and G. Flandrin. *Nouv Rev Fr Hematol* 13(6):755-760, 1973. (29 references)

- 6029 INVESTIGATIONS ON THE EFFECTS OF CHRONIC CIGARETTE-SMOKE INHALATION IN SYRIAN GOLDEN HAMSTERS. (E.) Döntenwill, W. (Res. Inst. German Cigarette Industry, Hamburg), H.-J. Chevalier, H.-P. Harke, U. Lafrenz, G. Reckzeh and B. Schneider. *J Natl Cancer Inst* 51(6):1781-1832, 1973.

Results of chronic inhalation experiments on Syrian golden hamsters are reported. Of 4440 hamsters, 3610 were used for their entire lifespans; the remaining 830 were exposed for no longer than 52 wks. Some animals received additional treatment with carcinogens. Survival times and body and organ-weight development were correlated with treatment or morphologic changes. Pathohistologic investigations of organs and tissues, hematologic examinations, and biochemical analyses of blood were performed. Experimental results demonstrated a dose-response relationship. Effects of smoke from various types of cigarettes and effects of combined smoke and carcinogen treatment were evaluated. The results were as follows: 1) Changes induced by smoke exposure—Striking differences were found between experimental groups. Alterations were most pronounced in the larynx and depended on duration of treatment and dosage; survival times were reduced, and loss of body weight was dose dependent; the number of erythrocytes increased and hemoglobin rose. 2) Changes enhanced by smoke exposure—Incidence of "smoke cells" was greater; increase in "adenomatoid lesions" was slightly significant. 3) Effects of treatment with dimethylbenzanthracene—The number of tumors increased in the oral cavity, pharynx, esophagus, stomach, trachea, liver, and ovary; the occurrence of ovarian cysts also increased. 4) Effects of nitrosamine treatment—Papillomas in the trachea and lower region of the larynx differed from those in animals exposed to smoke. 5) Changes not connected with treatment—Findings included stomach ulcers, gastritis, pulmonary emphysema, inflammation of the respiratory tract, generalized amyloidosis, testicular atrophy, vascular and heart diseases, muscular atrophy, formation of thromboses in heart and lungs, cardiomyopathy, inflammatory changes in the soft tissue and intestinal organs, bile-duct cysts, bile-duct proliferation; also tumors of the nasal cavity, skin, connective and supporting tissues, hematopoietic system, and adrenal glands, and biochemical and hematologic changes (apart from changes in erythrocytes and hemoglobin).

- 6030 ALTERED KARYOTYPES OF TRANSPLANTABLE "DIPLOID" TUMORS. (E.) Wolman, S. R. (New York U. Sch. Med., N.Y.), A. A. Horland and F. F. Becker. *J Natl Cancer Inst* 51(6):1909-1914, 1973.

Several transplantable rat hepatomas were reported to show "normal" diploid chromosome patterns. Two such tumors, originally induced by treatment of host animals with N-2-fluorenyl-phthalamic acid and N-2-fluorenyldiacetamide and designated 7800 and 9121, respectively, were studied with staining techniques (quinacrine and trypsin-Giemsa) that demonstrate intrachromosomal banding patterns. The 7800 tumor had minor variations in karyotype within

the range seen among nontumor cells. The 9121 tumor was characterized by asymmetry of the #2 chromosomes, one of which had a consistently abnormal banding pattern. Some cells also had 43 chromosomes with an extra small telocentric chromosome. Thus using banding techniques for chromosome analysis, a consistent abnormal banding pattern was observed in a proportion of cells with a diploid chromosome number from tumor line 9121. In addition, both diploid tumors showed numerical variation and alteration in the sex chromosomes.

- 6031 PRODUCTION OF URINARY BLADDER CARCINOMAS IN MALE HAMSTERS BY N-[4-(5-NITRO-2-FURYL)-2-THIAZOLYL]FORMAMIDE, N-[4-(5-NITRO-2-FURYL)-2-THIAZOLYL]ACETAMIDE, OR FORMIC ACID 2-[4-(5-NITRO-2-FURYL)-2-THIAZOLYL]HYDRAZIDE. (E.) Croft, W. A. (U. Wisconsin Med. Sch., Madison) and G. T. Bryan. *J Natl Cancer Inst* 51(3):941-949, 1973.

N-[4-(5-Nitro-2-furyl)-2-thiazolyl]formamide (FANFT), N-[4-(5-nitro-2-furyl)-2-thiazolyl]acetamide (NFTA), or formic acid 2-[4-(5-nitro-2-furyl)-2-thiazolyl]hydrazide (FNT), potent carcinogens for the rat, mouse, and dog, were fed at 0.1% of the diet to male weanling Syrian golden hamsters for 48 weeks, followed by control diet for an additional 22 weeks. The incidences of tumors were: FANFT--23 of 24 hamsters with urinary bladder transitional carcinomas, 5 of 24 with forestomach squamous cell papillomas, and 1 of 24 with an adrenal adenoma; NFTA--16 of 24 hamsters with urinary bladder transitional cell carcinomas, 1 of 24 with an adrenal adenoma, and 1 of 24 with adrenal adenocarcinoma; and FNT--9 of 24 hamsters with urinary bladder transitional cell carcinomas, 13 of 24 with forestomach squamous cell papillomas, 6 of 24 with adrenal adenomas, and 1 of 24 with a renal transitional cell carcinoma. Only one adrenal adenoma was found in the untreated hamsters. These data demonstrate that hamsters are as susceptible as other species to the carcinogenicity of 5-nitrofurans. The production of bladder carcinomas in hamsters with FANFT, NFTA, and FNT suggests that these compounds may be carcinogenic hazards for man.

- 6032 TRANSPLACENTAL EFFECTS OF 1-ETHYL-1-NITROSOUREA IN INBRED STRAINS OF MICE. III. ASSOCIATION BETWEEN INFECTIOUS OR SUBINFECTIOUS ENDOGENOUS TYPE-C RNA TUMOR VIRUS EXPRESSION AND CHEMICALLY INDUCED TUMORIGENESIS. (E.) Diwan, B. A. (Jackson Lab., Bar Harbor, Me.), H. Meier and R. J. Huebner. *J Natl Cancer Inst* 51(6):1965-1970, 1973.

The transplacental effects of 1-ethyl-1-nitrosourea (ENU) was examined in mouse strains AKR/J, DBA/2J, SWR/J, C57BL/6J, and C57L/J with respect to possible viral-chemical cocarcinogenesis. The incidence of type-C RNA viral genome expression, particularly the species-specific, group-specific antigen (gs-AG) increased after transplacental administration of ENU. A significant association existed between gs-AG and, in some cases, complete virus expression and chemically induced tumors in mice. However, the rate of tumor induction and infectious or subinfectious (gs-AG) viral expression was influenced by the host

genotype or strain of mouse. Specifically, the induction of tumors by ENU in AKR/J and DBA/2J mice with complete viral expression was accelerated, and with the specific oncogenic viral mechanism inherent, but largely unexpressed, in strains SWR/J, C57BL/6J, and C57L/J, ENU induced tumors as well as gs-AG expression in most mice. Also, a previously unrevealed genetic propensity of AKR/J mice for pulmonary tumorigenesis was found with ENU treatment.

- 6033 INDUCTION OF MITOTIC ABNORMALITIES IN ONION ROOT-TIPS BY TOBACCO SMOKE CONDENSATE. (E.) Bhalla, P. R. (Thomas Hunt Morgan Sch. Biol. Sci., U. Kentucky, Lexington), T. S. Kochhar and P. S. Sabharwal. *Cytologia* 38(4):707-712, 1973.

The influence of the water-soluble extract of tobacco smoke condensate (TSC) on the mitotic process in young roots obtained from onion bulbs was studied. During the course of the 24 hr treatment, roots in control medium and 0.001% TSC showed some increase in length; no root growth occurred in higher concentrations of TSC. At TSC concentrations of 0.04%, 0.05%, and 0.1%, changes were found in the cytoplasm and nuclei of the root cells; these changes included vacuolization and pynotic nuclei. The percentage of cells showing irregular mitotic divisions was 12%, 21%, 37%, and 62% in the 0.04%, 0.05%, 0.1% and 0.25% TSC media, resp. The abnormalities were most numerous in metaphase. Roots grown in control media and media containing 0.001% or 0.01% TSC showed the same mitotic index. From 0.001% TSC to 0.04% TSC, the mitotic index declined from 0.11 to 0.02; no further decreases were noted at higher TSC concentrations.

- 6034 FAST ONSET OF DNA SYNTHESIS STIMULATED BY TUMOR PROMOTER IN MOUSE EPIDERMIS AT THE INITIATION STAGE OF CARCINOGENESIS. (E.) Frankfurt, O. S. (Dept. Kinetics Chem. Biol. Processes, Inst. Chem. Physics, Moscow, USSR) and E. Raitcheva. *J Natl Cancer Inst* 51(6):1861-1864, 1973.

Mouse skin was treated with 7,12-dimethylbenz[a]-anthracene (DMBA), benzo[a]pyrene (BP), or urethan. After five wk, on the same region of skin, 0.5, 0.1, or 0.02% croton oil was applied. ³H-thymidine (³H-TDR) was injected every 4th hr during a 20- to 24-hr period after application of croton oil. The labeling index in interfollicular epidermis was determined autoradiographically. Croton oil induced transition to the DNA synthesis phase in most basal cells. The mean time between application of croton oil and transition of basal cells to the DNA synthesis phase was significantly shorter in DMBA-"initiated" epidermis than in normal epidermis for three concentrations of croton oil. The labeling index for mature cells also increased more rapidly in epidermis treated with initiator. The difference between normal and initiated epidermis was most pronounced after 0.1% croton oil was applied. With this concentration, initiation with BP and urethan also shortened the time between stimulation and onset of DNA synthesis. Without stimulation, the labeling index curves for basal cells did not differ

in normal and initiated epidermis on repeated injections of ³H-TDR. Fast onset of stimulated DNA synthesis possibly is characteristic of epidermis treated with initiators and results from increased sensitivity of the genome to tumor promoters.

- 6035 OVARECTOMY AND POSTPARTUM GROWTH OF RAT MAMMARY TUMORS. (E.) McCormick, G. M., II (Louisiana State U. Med. Ctr., Shreveport). *Eur J Cancer* 9(10):775-776, 1973.

Sprague-Dawley rats with palpable DMBA-induced mammary tumors were bred, ovariectomized on day 2 postpartum, and allowed to nurse 6, 9, or 12 pups for 21 days. The tumors first appeared during pregnancy and grew until parturition. In intact dams nursing six pups, 53.8% of the tumors were static or growing. In ovariectomized rats nursing pups, there was a significant decrease in the number of static or growing tumors; there were no significant differences in the number of growing tumors among ovariectomized females nursing 6, 9, or 12 pups. In all rats, significant regression was seen in all tumors which were not static or growing. The data indicate that ovarian progesterone is necessary for the postpartum growth of DMBA-induced rat mammary tumors and that prolactin has little direct effect on such growth.

- 6036 DEPRESSIVE EFFECT OF 7,12-DIMETHYLBENZ-[a]ANTHRACENE AND IONIZING IRRADIATION ON BONE MARROW COLONY-FORMING CELLS. (E.) Ball, J. K. (Cancer Res. Lab., U. Western Ontario, London, Canada), S. Hoshino and J. A. McCarter. *J Natl Cancer Inst* 51(5):1491-1495, 1973.

Treatment of neonatal inbred CFW/D mice with 7,12-dimethylbenz[a]anthracene (DMBA) or γ -irradiation suppressed the number of colony-forming units (CFUs) or stem cells in the bone marrow. By 14 days after administration, DMBA (30 μ g) had induced an 85% depression; by 60 days post treatment, there was still a 60-70% suppression. The extent and duration of the depression after the neonatal exposure to 400 rads (whole body) were similar. The permanent reduction in CFUs after neonatal irradiation contrasted sharply with the short-term effect of such a dose administered to adult animals. For both DMBA and irradiation treatment, the extent of the depression was dose dependent at low doses only. The effect of DMBA on the number of bone marrow stem cells was not merely quantitative; the CFUs remaining after treatment had a diminished ability to form spleen colonies on secondary transplantation.

- 6037 EFFECT OF PYRENE AND BENZOPYRENE ON *SACCHAROMYCES CEREVISIAE* CULTURES. (Ger.) Obrikat, H. (Hyg. Inst., Humboldt U., Berlin, Germany) and K. Wettig. *Arch Geschwulstforsch* 42(3):198-202, 1973.

Saccharomyces cerevisiae was incubated at 25 C with various concentrations of pyrene and benzo(a)pyrene (BP) to study the effects of these hydrocarbons

on cell growth, fermentation, and the DNA content of the cells. At concentrations of less than 50 µg/ml, no change occurred in cell growth. A 30% increase occurred in the number of cells, compared with control cultures, when yeast was incubated with 100 µg/ml of either hydrocarbon. Exposure of cultures to UV light for 15 min/day decreased the number of cells in yeast cultures incubated with hydrocarbons. For the first four days, carbon dioxide production was greater in cultures incubated with hydrocarbons than in control cultures. At concentrations of 50 µg/ml, both pyrene and BP increased carbon dioxide production to about the same extent; a decrease occurred at concentrations of 50-100 µg/ml. At a concentration of 100 µg/ml, BP decreased carbon dioxide production by an average of 90%, while pyrene had no appreciable effect. If yeast cultures were incubated at 4°C in the absence of KH_2PO_4 to prevent cell growth, both hydrocarbons increased fermentation by 10% for the first four days. DNA measurements showed that BP increased the number of polyploid cells, suggesting that changes in the DNA content produce metabolic changes.

- 6038 EFFECT OF AMMONIUM CHLORIDE ON INCIDENCE OF BLADDER TUMORS INDUCED BY 4-ETHYLSULFONYLNAPHTHALENE-1-SULFONAMIDE. (E.) Flaks, A. (Sch. Med., U. Leeds, England), J. M. Hamilton and D. B. Clayson. *J Natl Cancer Inst* 51(6):2007-2008, 1973.

A study was initiated to investigate, on a long-term basis, whether the incidence of 4-ethylsulfonylnaphthalene-1-sulfonamide (ENS)-induced bladder tumors could be altered by prevention of the occurrence of an alkaline urine and the subsequent formation of calculi. Treatment of female (IF X C57)F₁ mice with ENS produced an alkaline urine associated with the formation of calculi in the bladder and with hydro-nephrosis. Extensive epithelial hyperplasia and, in some mice, tumors were noted in the bladders. If, however, the urine was made acid through the addition of ammonium chloride (NH_4Cl) to the drinking water, neither calculi nor tumors of the bladder were present, though a mild epithelial hyperplasia persisted. Mice treated with NH_4Cl alone and untreated controls had no histopathologic changes. Physical injury by calculi and/or elevated pH of the urine induced by ENS are essential for bladder tumors to develop. The evidence is sufficient to make it mandatory to examine the urine and urinary bladder for crystalluria or calculi before accepting bladder tumors as evidence of the presence of a possible carcinogen in man.

- 6039 ENZYME PATTERNS OF GLUCOSE CATABOLISM IN HORMONE-DEPENDENT AND -INDEPENDENT MAMMARY TUMOURS OF GR MICE. (E.) Briand, P. (Fibiger Lab., Copenhagen, Denmark), J. L. Daehnfeldt, W. Mollgaard, M. Hansen and E. L. Christensen. *Eur J Cancer* 9(10):763-770, 1973.

Mammary tumors were induced in ovariectomized GR female mice by feeding estrone in the drinking water and giving weekly injections of progesterone pellets. The tumor incidence was 90% after 14 wk of treatment. More than 90% of the induced tumors

proved to be hormone dependent, and remained so for the next few serial transplantations, after which they changed into hormone independent tumors. The determination of the hexokinase, phosphofructokinase, pyruvate kinase, and lactate dehydrogenase activity of the hormone dependent tumors showed a consistent increase as compared to virgin, though not to lactating, mammary gland. However, only hexokinase activity was further increased by the transition to autonomy. In agreement with this, lactate accumulation was significantly higher in autonomous compared to hormone dependent tumors. The activity of glucose-6-phosphate dehydrogenase was significantly lower in autonomous tumors as compared to hormone dependent tumors and virgin mammary gland. No increase in activity could be induced in autonomous tumor tissue by the administering estrone.

- 6040 FAILURE OF METOPIRONE TO PROTECT RATS FROM ADRENAL HYPERTENSION INDUCED BY 7,12-DIMETHYLBENZ(α)ANTHRACENE. (E.) Kellen, J. A. (Dept. Clin. Biochem., U. Toronto, Canada). *Oncology* 28(4):299-305, 1973.

Female Sprague-Dawley rats were given three i.v. injections of 7,12-dimethylbenz(α)anthracene (DMBA); a second group was given concurrent injections of Metopirone; and a third group was given a single injection of Metopirone. All rats injected with DMBA alone developed an average of 4 mammary tumors. All rats treated with DMBA plus Metopirone developed an average of 2 mammary tumors and 2.2 other tumors. The body weights of both of these groups were significantly lower than those of a group of controls. Many animals treated with DMBA alone or with Metopirone developed persistent and significantly elevated blood pressures: the hypertensive rats had significantly heavier adrenal glands. The adrenals of 40% of the rats treated with DMBA alone showed infarctions and scars in the fasciculate zone; no histologic changes were noted in the adrenals of the animals treated with DMBA in conjunction with Metopirone.

- 6041 SUPPRESSION OF DIRECT ANTIBODY PLAQUE FORMING SPLEEN CELLS BY THE LEUKEMOGENIC COMPOUND, N-METHYL-N-NITROSOUREA, AFTER IMMUNIZATION OF MICE WITH SHEEP RED BLOOD CELLS. (Ger.) Gryschek, G. (Ctr. Inst. Cancer Res., German Acad. Sci., Berlin) and G. Pasternak. *Acta Biol German* 29(6):907-917, 1972.

Newborn (24-72-hr-old) and adult (10-12-wk-old) CBA/Bln mice received injections of methylnitrosourea (MNU; 50 mg/kg) either i.p. or s.c. Newborn mice were immunized i.p. 2.5-3 months later with sheep RBC, while adults were immunized one day before, one day after, or on the same day they received the MNU injection. The response to immunization was measured by counting the number of antibody plaque-forming cells in the spleen (Jerne test). The number of antibody plaques was reduced to less than 50% of control values in more than one-half (19 of 32) of females but in only one-third (14 of 36) of the males injected with MNU as newborns. The dif-

ference between MNU-treated and control mice was significant only for females. In adults, MNU decreased plaque-forming cells by more than 50% in 12 of 24 mice when it was injected one day before sheep RBC, in 9 of 24 mice when it was injected on the same day and in 24 of 24 mice when it was injected one day after sheep RBC. Statistical analysis of the differences showed that immune response was suppressed significantly only when MNU was administered one day after sheep RBC. When both MNU and sheep RBC were injected on the same day, the immune response was stimulated in a large percentage of the mice. When MNU and sheep RBC were incubated together for one hr at room temperature, centrifuged and injected separately i.p. into adult mice, the immune response was stimulated to the same extent as when MNU and sheep RBC were injected separately. Although these doses of MNU were not toxic for adult mice, they did eventually induce leukemia. These findings suggest that MNU does not directly cause malignant transformation in the cells but acts by activating a latent leukemia virus. It is recommended that MNU not be used as an immunosuppressant because of its carcinogenic activity.

- 6042 THE SUBCELLULAR DISTRIBUTION OF TRITIATED 4-DIMETHYLAMINOAZOBENZENE AND 2-METHYL-4-DIMETHYLAMINOAZOBENZENE IN RAT LIVER AND SPLEEN FOLLOWING A SINGLE ORAL ADMINISTRATION. (E.) Albert, A. E. (Chester Beatty Res. Inst., London, England) and G. P. Warwick. *Chem Biol Interact* 5(1):65-68, 1972.

Tritiated 4-dimethylaminoazobenzene (DAB) and 2-methyl-4-dimethylaminoazobenzene (2-MeDAB) in arachis oil were administered by stomach tube at dose levels of 45 mg/kg to male hooded rats of the Chester Beatty strain. The animals were killed at various time intervals up to 48 hr and their livers and spleens removed and fractionated into subcellular components. The soluble supernatant fractions contained the highest levels of radioactivity from both dyes, while the mitochondrial, microsomal, and nuclear fractions contained progressively less. Higher levels of radioactivity associated with 2-MeDAB were bound to the liver mitochondrial fractions, whereas more radioactivity associated with DAB was bound to the nuclear fraction. In general, the level of radioactivity present in the spleen fractions was considerably lower than in the corresponding liver fractions.

- 6043 COMBINED NEOPLASTIC EFFECTS OF VACCINIA VIRUS AND 3-METHYLCHOLANTHRENE. III. SUSCEPTIBILITY AND RESISTANCE IN TRANSPLANTED MOUSE SKIN. (E.) Duran-Reynals, M. L. (Albert Einstein Coll. Med., Bronx, N.Y.), M. Zisblatt and F. Lilly. *J Natl Cancer Inst* 51(5):1597-1601, 1973.

In cortisone-pretreated mice, susceptibility to the acute, local effects of vaccinia virus was correlated with susceptibility to the neoplastic effects of 3-methylcholanthrene (MCA) painting. To determine the relative importance of local versus systemic factors in these responses, susceptibility and

resistance to both agents were investigated in transplanted skin. (BALB/c X AKR)_{F1} hybrids, susceptible to both agents, received skin grafts from either resistant AKR or even more highly susceptible BALB/c parental mice. Control groups included isografted AKR, BALB/c, and (BALB/c X AKR)_{F1} mice. After the grafts had healed, the mice first received cortisone and then vaccinia virus inoculated intradermally into the graft. MCA was then painted over both the grafted and adjacent host skin. Since vaccinia virus infection spread into the host skin, the acute effects of the virus and the neoplastic effects of the carcinogen could be observed in both graft and host skin. Isografting did not modify the responses of the skin. In _{F1} mice bearing AKR skin, the graft remained resistant to both agents and the surrounding host skin remained susceptible to both; in hybrids bearing BALB/c skin, the grafts and the host skin were susceptible to both agents. These findings indicate that susceptibility or resistance to both vaccinia virus and MCA painting is determined by local rather than systemic factors, presumably at the level of the target cell.

- 6044 DMBA, HYPERTENSION AND IMPAIRED ADRENAL MITOCHONDRIAL DIFFERENTIATION. (E.) Anderson, K. M. (Dept. Clinical Biochem., U. Toronto, Canada) and J. A. Kellen. *Oncology* 28(4):365-377, 1973.

Persistent hypertension developed in over 50% of a group of young female Sprague-Dawley rats which were given three i.v. injections of 7,12-dimethylbenz(a)anthracene (DMBA). The adrenals of these animals were examined via light and electron microscopy. The adrenals from hypertensive animals exposed 3 to 5 months previously to DMBA contained poorly differentiated mitochondria, which were seen most frequently in the adrenals of the most severely hypertensive animals, and were often closely associated with differentiated mitochondria in the same or adjacent cells; the adrenals from normal control rats contained highly differentiated mitochondria. The adrenals from the hypertensive animals also contained occasional 'giant' mitochondria with well-developed cristae distributed throughout their interiors. Exposure to DMBA coupled with the development of hypertension and the occurrence of structurally immature adrenal cortical mitochondria may provide the basis for a form of adrenal regeneration hypertension. The persistence of structurally abnormal mitochondria long after exposure to the carcinogen might be explained in terms of a carcinogen-induced defect in the cellular response to ACTH and/or an abnormality in the cytoplasmic synthesis of proteins required for normal mitochondrial development.

- 6045 KINETICS OF NITROSATION OF THE AMINO ACIDS PROLINE, HYDROXYPROLINE, AND SARCOSE. (E.) Mirvish, S. S. (U. Nebraska Med. Ctr., Omaha), J. Sams, T. Y. Fan and S. R. Tannenbaum. *J Natl Cancer Inst* 51(6):1833-1839, 1973.

The kinetics of nitrosation of the amino acids pro-

line (Pro), hydroxyproline (HyPro), and sarcosine (Sar) were studied by two methods which gave similar results. The pH optimum was 2.5, compared with 3.4 for simple secondary amines. At pH 2.5 and 25° C, pH-dependent rate constant k_1 was 0.037 (Pro), 0.31 (HyPro), and 0.23 (Sar) $M^{-2} \text{ sec}^{-1}$. Equations were developed for pH-independent rate constant k_2 , based on the complex ionization of amino acids and the dissociation constants of the amino acid methyl esters. These satisfactorily explained the pH dependency of k_1 . The value of k_2 [1.4 (Pro), 2.1 (HyPro), and 2.6 (Sar) $\times 10^5 M^{-2} \text{ sec}^{-1}$ at 25° C] varied <15% from the mean values over pH 1-3.75 (with some exceptions), and was similar to k_2 for five simple secondary amines. L-Prolyglycine and prolylleucylglycylamide were nitrosated seven to ten times more readily than Pro, with pH optima of 3.0 and 3.4, respectively. Thiocyanate increased the rate of Sar nitrosation 10- to 400-fold, especially at low pH; the kinetics of this effect were examined. Citrate-perchlorate buffers at low pH and high concentrations of chloride were weakly inhibitory. The most significant application of this work may be in predicting nitrosamino acid formation during food storage or preparation, since these compounds may be decarboxylated to give highly carcinogenic nitrosamines when the food is cooked. The kinetics could be different, however, at the low reactant concentrations expected in the stomach.

- 6046 HISTOPATHOLOGIC STUDIES ON LIVER TUMORIGENESIS INDUCED IN MICE BY TECHNICAL POLYCHLORINATED BIPHENYLS AND ITS PROMOTING EFFECT ON LIVER TUMORS INDUCED BY BENZENE HEXACHLORIDE. (E.) Ito, N. (Cancer Ctr. Inst., Nara Med. U., Japan), H. Nagasaki, M. Arai, S. Makiura, S. Sugihara and K. Hirao. *J Natl Cancer Inst* 51(5):1637-1646, 1973.

The effects of technical polychlorinated biphenyls (PCBs) on mouse liver were examined histologically and ultrastructurally. Pathologic studies were also made on the effects of PCBs on tumorigenesis induced by benzene hexachloride (BHC) in mouse liver. Neoplastic changes were observed in livers of male dd mice fed a basal diet containing 500 ppm of the PCBs, Kanechlor 500, for 32 wk. Amyloid degeneration in the livers of mice was observed in groups fed a diet containing lower concentrations of PCBs. Histologically and ultrastructurally, the neoplasms induced by PCBs appeared to be typical nodular hyperplasias and well-differentiated hepatocellular carcinomas. The effects of PCBs on neoplastic changes induced by isomers of BHC in the livers of mice fed a diet containing BHC with or without PCBs for 24 wk were studied. Among groups fed BHC alone, only the group receiving 250 ppm of the α -isomer developed nodular hyperplasia and hepatocellular carcinoma. However, among the groups fed BHC plus PCBs, only those receiving 100 or 50 ppm of α -BHC or 250 or 100 ppm of β -BHC developed nodular hyperplasia and hepatocellular carcinoma. Groups fed γ -BHC with or without PCBs did not show neoplastic changes of the liver. Thus PCBs themselves induced hepatic neoplasms in mice and also promoted the induction of tumors by α -BHC and β -BHC.

- 6047 ADENOCARCINOMAS OF THE ETHMOID SINUS IN WORKERS EXPOSED TO SAWDUST. (Fr.) Adenis, L. (Oscar Lambret Ctr., Lille, France), B. Vankemmel, G. Egret and A. Demaille. *Arch Mal Prof* 34(10/11):644-646, 1973.

Of 125 patients with nasal and sinus cancers, 33 had carcinomas of the ethmoid sinuses, 22 had cancers of the nasal fossa and 70 had cancers of the sphenoid and maxillary sinuses. Histological examinations of tumors of the ethmoid sinuses revealed that 18 were adenocarcinomas, 12 were malpighian epitheliomas and three were reticulum cell sarcomas. This high incidence of adenocarcinomas was characteristic for tumors of the ethmoid sinuses: only one of 22 tumors of the nasal fossa and two of 72 tumors of the sphenoid and maxillary sinuses were adenocarcinomas. Of the 14 men with adenocarcinomas of the ethmoid sinuses, ten were woodworkers. These consisted of six cabinet makers, one polisher, one cooper, one lumberman and one broom maker. The other men were agricultural workers (two), a miner (one) and a textile foreman (one). No information was available about the occupations of the four women with adenocarcinomas of the ethmoid sinuses. Other investigators have found that the latent time for adenocarcinomas of the ethmoid sinuses is very long (39 yr). One of the authors' patients, a 69-yr-old retired miner, had worked as a cabinetmaker for only 3 yr between the ages of 17 and 19 yr. This suggests that early, rather than long, exposure to sawdust is the determining factor in the development of this type of cancer.

- 6048 PRODUCTION OF METASTASES BY TREATMENT WITH CARCINOSTATIC AGENTS. III. LOW CONCENTRATION OF CARCINOSTATIC AGENTS ON THE CELLS. (E.) Kondo, T. (Nagoya U. Sch. Med., Japan), H. Ichihashi, Y. Shizu, Y. Momoi, Y. Kawashima, H. Yamada and M. Ishii. *Nagoya J Med Sci* 36:1-10, 1973.

Male Swiss ICR/Ha mice were injected i.v. with viable Ehrlich carcinoma cells and treated i.p. with nitrogen mustard N-oxide once daily for eight successive days. Female Gifu rats were injected i.v., i.p., or in the right axillary space with viable Yoshida sarcoma cells, after which they were treated with nitrogen mustard N-oxide, Mitomycin-C, or Chromomycin A₃. In another group of rats, an s.c. Yoshida sarcoma which had been incubated for 1 hr with nitrogen mustard N-oxide or Mitomycin-C was transplanted s.c. into a new recipient. Low doses of nitrogen mustard N-oxide resulted in the early death of mice bearing Ehrlich ascites carcinomas and in an increase in the number of circulating Yoshida sarcoma cells in the rats. The growth of transplanted Yoshida sarcomas was stimulated after contact with low concentrations of nitrogen mustard N-oxide *in vitro* or i.p. Low concentrations of Mitomycin-C and Chromomycin A₃ also increased tumor growth and metastasis formation. In a second experiment, HeLa cells were cultured with nitrogen mustard N-oxide, Mitomycin-C, or Chromomycin A₃. The proliferation of these cells was stimulated by the addition of these agents. In a third study, patients with stomach carcinomas were given nitrogen mustard N-oxide, Mitomycin-C, or Chromomycin A₃ i.v.,

after which previously introduced physiological saline was removed from their stomachs by gastric suction. The drug treatments greatly increased the number of cancer cells released into the stomach cavities of these patients. In all three studies, larger doses of nitrogen mustard N-oxide, Mitomycin-C, and Chromomycin A₃ inhibited the growth and/or metastasis of the tumors.

- 6049 INCREASED AFLATOXIN G₁ PRODUCTION BY *ASPERGILLUS FLAVUS* VIA GAMMA IRRADIATION. (E.) Applegate, K. L. (Dept. Poultry Sci., Ohio State U., Columbus) and J. R. Chipley. *Mycologia* 65(6):1266-1273, 1973.

The growth and sporulation of *Aspergillus flavus* NRRL A-12268 and NRRL 3145 in cracked hard red wheat and synthetic media were greatly reduced following exposure of these organisms to irradiation of 300 krad, with complete growth inhibition resulting from exposure to 400 or 600 krad. Exposure of *A. flavus* NRRL A-12268 to 25, 50, 100, 150, 200, 300, 400, or 600 krad did not induce the production of aflatoxin G₁ in wheat or a synthetic medium. However, the quantities of aflatoxin G₁ produced in wheat from cultures developing from toxigenic spores (NRRL 3145) which had been irradiated with 150, 200, or 300 krad were greater than those produced by similarly treated nonirradiated toxigenic spores. Cultures exposed to 150 or 300 krad produced aflatoxin G₁ 36 hr later than control cultures. Spores (*A. flavus* NRRL 3145) irradiated at 300 krad developed into cultures producing significantly less aflatoxin G₁ than cultures from nonirradiated spores; other levels of irradiation did not cause a significant change in the production of aflatoxin G₁.

- 6050 ASBESTOSIS, BRONCHIAL CARCINOMA AND PULMONARY TUBERCULOSIS. (Ger.) von Arnim, H.-H. (Diakonie Hosp., Schwabisch Hall, Germany). *Prax Pneumol* 27(6):353-358, 1973.

Case reports are presented for four patients who had asbestosis associated with asbestos-induced pulmonary tuberculosis and, in three cases, cancer. A 23-yr-old man with moderately severe asbestosis had an infiltrative process in the left hilar region. *Mycobacterium tuberculosis* and undifferentiated squamous epithelial cells were found in bacteriological and cytological examinations of the sputum. Since the lesion responded to tuberculostatic agents and chemotherapy (unspecified), it is concluded that cellular metaplasia was mistaken for carcinoma cells in the cytological examination. The second patient was a man with moderately severe asbestosis who developed bilateral pulmonary tuberculosis. One yr later a cytological examination of the sputum showed evidence of a squamous cell carcinoma, and two yr after this definite radiological confirmation was obtained. The patient died two yr later with jaundice, pain in the liver and ischialgia. Autopsy permission was refused, but the patient probably had a metastasizing bronchial carcinoma. The third patient had severe asbestosis with cavernous tuberculosis and died of stomach cancer. It is suggested

that the gastric tumor was induced by transperitoneal migration of asbestos fibers. The fourth patient, who had been exposed to asbestos dust for 10 yr, developed severe asbestosis and rapidly progressing pulmonary tuberculosis. Bronchoscopic and histological examinations performed one month after institution of therapy established the diagnosis of bronchial carcinoma. The patient died eight months later, and these findings were confirmed at autopsy.

- 6051 3-METHYLCHOLANTHRENE INDUCED ALTERATIONS IN A MAMMALIAN CELL LINE CULTURED 'IN VITRO'. (E.) Ghosh, S. N. (Dept. Biochem., U. Coll. Sci., Calcutta, India) and S. K. Bose. *Indian J Cancer* 10(2):143-154, 1973.

Normal kidney cortical cells (MK) from a healthy male Swiss Albino mouse were incubated with 3-methylcholanthrene (MC) dissolved in acetone or dimethylsulfoxide (DMSO). The MC showed a dose-dependent toxicity which was greater when the carcinogen was dissolved in DMSO. The MC treated cells also showed variations in clonal morphology, the frequency of occurrence of these variants being 0.5% in cells treated with MC dissolved in acetone and 0.2% in cells treated with MC dissolved in DMSO; these variations were heritable. The variants differed from the parent cell line, and in some cases from each other, with respect to clonal diameter, clonal outline, cloning efficiency, and clonal thickness (in terms of layers of cells). In liquid stationary culture, the parental line grew in monolayers due to contact inhibition, while the variant lines showed a loss of contact inhibition with varying degrees of piling up and random arrangement. The parental and variant lines did not differ significantly in their rate of growth in liquid suspension, although some of the variants showed considerable difference in growth rate when grown in agar culture. The life span of the variants was greatly increased as compared with the parental line. Two of the variants showed increased resistance of MC toxicity, while two others remained like the parental line.

- 6052 THE INTRA-CHROMOSOMAL DISTRIBUTION OF (³H)-DIMETHYLAMINOAZOBENZENE IN RAT LIVER NUCLEI 'IN VIVO'. (E.) Albert, A. E. (Royal Cancer Hosp., London, Great Britain) and G. P. Warwick. *Chem Biol Interact* 5(1):61-64, 1972.

(³H)-dimethylaminoazobenzene in arachis oil was administered by stomach tube (45 mg/kg) to male hooded rats of the Chester Beatty strain. The animals were killed at various time intervals up to 48 hr after the dye administration, and the nucleohistone and acidic nuclear proteins were extracted from the pooled livers. The specific radioactivity was higher in the acidic nuclear protein fraction than in the nucleohistone fraction, the maximum level of binding occurring 24 hr after administration of the tritiated dye. Assuming that the masses of DNA and histone in nucleohistone are approximately equal, the label bound to DNA was only 6% of the amount bound to the acidic nuclear proteins.

- 6053 STIMULATION OF DNA SYNTHESIS IN HYDROCARBON-TRANSFORMABLE HAMSTER EMBRYO CELLS BY THE K-REGION EPOXIDE OF BENZ(A)ANTHRACENE. (E.) Marquardt, H. (McArdle Lab. Cancer Res., U. Wisconsin, Madison) and C. Heidelberger. *Chem Biol Interact* 5(1):69-72, 1972.

Secondary cultures of Syrian hamster embryo cells were plated and treated with K-region derivatives of benz(a)anthracene (BA). The incorporation of thymidine into the DNA of the logarithmically growing cells during the first 24 hr after BA administration was not affected by the BA derivatives which have not been found to produce malignant transformation. However, two derivatives (the K-region epoxide and the K-region cis-dihydrodiol) which have been found to transform hamster embryo cells significantly increased the incorporation of thymidine into DNA; there was no significant increase in the number of cells after 24 hr. The two transforming derivatives caused increased thymidine incorporation only in concentrations which caused transformation; lower concentrations were inactive and toxic higher concentrations decreased the incorporation of thymidine into DNA. The K-region epoxide did not reverse the block in DNA synthesis effected by contact inhibition, X-irradiation, or 5-fluorodeoxyuridine.

- 6054 CORRELATIONS BETWEEN CIGARETTE SMOKING, TUBERCULOSIS AND LUNG CANCER. (Cz.) Kri-vinka, R. (Res. Inst. Tuberculosis Respiratory Dis., Prague, Czechoslovakia) and A. Kubik. *Stud Pneumol Phtiseol Cechoslov* 33(7):484-488, 1973.

Correlations between cigarette smoking, tuberculosis and lung cancer were analyzed in 939 male patients with a confirmed diagnosis of lung cancer. Of these patients, 922 (98.2%) were cigarette, cigar or pipe smokers and 17 (1.8%) were nonsmokers. Radiological or histological evidence of pulmonary tuberculosis was found in 414 (44.1%) of these patients. It is estimated that 73.7% of the patients with lung cancer alone and 75.7% of those with lung cancer and tubercular changes in the lungs had smoked more than 200,000 cigarettes at the time they were diagnosed. The difference between these groups is not significant. Only about 2% of these patients with lung cancer were less than 40 yr old; the largest percentage were in the 60-69 yr age group. In most patients, both those with evidence of pulmonary tuberculosis and those without it, the latent period was 20-30 yr. It is recommended that an anti-smoking campaign be directed toward discouraging young people from smoking.

- 6055 *IN VIVO* EFFECT OF SOME NAPHTHALENE-RELATED COMPOUNDS ON ARYL HYDROCARBON (BENZO[a]-PYRENE) HYDROXYLASE. (E.) Alexandrov, K. (Inst. Scientific Res. Cancer, Villejuif, France) and C. Frayssinet. *J Natl Cancer Inst* 51(3):1067-1069, 1973.

Naphthalene injected intraperitoneally inhibited aryl hydrocarbon (benzo[a]pyrene) hydroxylase (AHH) in male Wistar rat liver homogenate and microsomal

preparations. Pretreatment with naphthalene also decreased the induction of this enzyme by methylcholanthrene, a strong inducer of AHH. However, 1,3-naphthalenediol slightly increased the level of AHH in liver, whereas 2-methyl- β -naphthothiazole increased AHH in both liver and lung. 1-Naphthylamine, 2-naphthylamine, and 1,8-diaminonaphthalene increased AHH in lung and especially in kidney homogenates and microsome preparations. 1-Naphthol, 2-naphthol, 1-naphthonitrile, 2-naphthonitrile, 1-naphthyl phosphordicloridate, and 2-naphthyl phosphordicloridate had no effect on AHH.

- 6056 RNA SYNTHESIS IN THE UTERINE EPITHELIUM STIMULATION BY ESTROGEN INJECTION. (E.) Stepleski, Z. (Inst. Oncology, Gliwice, Poland) and W. Waronski. *Acta Histochem* 47(2):216-219, 1973.

Castrated BALB/c mice were injected s.c. with 17- β -estradiol and i.p. with actinomycin D. 3 H-uridine was injected i.v. and 3 hr later the animals were killed and samples of uterine tissue collected and studied autoradiographically and cytochemically. The incorporation of 3 H-uridine into the uterine epithelium was stimulated by the estrogen treatment and reduced to control levels by actinomycin D treatment. The blocking effect of the actinomycin D was observed in the cytoplasm, nuclei, and nucleoli. The estradiol treatment also stimulated the development of lysosomes and Golgi structures, while actinomycin D inhibited this development.

- 6057 SOME ELECTRICAL PROPERTIES OF CHEMICALLY INDUCED TUMOR CELLS. (E.) Chowdhury, T. K. (U. Oklahoma Hlth. Sci. Ctr., Oklahoma City) and A. C. Chou. *J Natl Cancer Inst* 51(6):1981-1982, 1973.

A refined microelectrode technique was used to determine whether the intracellular electrical potential and membrane resistance of tumor cells differed from those of the normal cells. 3-Methylcholanthrene-induced tumor cells of mouse skin had smaller intracellular electrical potential and higher membrane resistance than the corresponding normal cells. In the normal cells, the magnitudes of these electrical properties were within a narrow range; in the tumor cells, however, the magnitudes of both electrical parameters exhibited much larger variations. The results suggest that the large scatter in these electrical properties among the tumor cells is due to a varying degree of physicochemical transformation of the cell membranes.

- 6058 TRANSPLANTATION OF CHEMICALLY INDUCED METASTATIC MUCINOUS ADENOCARCINOMAS OF THE JEJUNUM AND COLON IN RATS. (E.) Ward, J. M. (Natl. Cancer Inst., Bethesda, Md.), R. S. Yamamoto, J. H. Weisburger and T. Benjamin. *J Natl Cancer Inst* 51(6):1997-1999, 1973.

Two Fischer rats given injections of 1,2-dimethylhydrazine developed mucinous adenocarcinomas of the

colon or jejunum which metastasized to the peritoneal and pleural cavities. Portions of metastatic peritoneal tumors were transplanted into weanling rats. The latent periods after i.p. injection were reduced from two to three months in the first passages to 28-35 days by the fifth passages. At necropsy of these rats, tumors were found throughout the peritoneal and pleural cavities. S.c. transplants grew progressively and metastasized to the lungs. Histology of transplanted tumors was similar to that of primary tumors, with some differences. Osteoid metaplasia was a feature of the jejunal transplants. The location and environment of the intestinal tumors may have some effect on the morphology of the tumors. Peritoneal metastases of the primary tumors had a prominent stroma, as did many of the peritoneal transplants. Pleural tumors in transplant rats were usually more cellular than peritoneal and s.c. tumors.

6059 INDUCTION OF STOMACH CANCER IN RATS AND MICE BY HALOGENATED ALIPHATIC FUMIGANTS.

(E.) Olson, W. A. (Hazelton Labs., Inc., Vienna, Va.), R. T. Habermann, E. K. Weisburger, J. M. Ward and J. H. Weisburger. *J Natl Cancer Inst* 51(6):1993-1995, 1973.

Ethylene dibromide (EDB) and 1,2-dibromo-3-chloropropane (DBCP) were administered to Osborne-Mendel rats and (C57BL X C3H) F_1 mice via chronic oral intubation five times per wk at experimentally predetermined maximally tolerated doses and at half those doses. Fifty animals of each sex were used for each dose level - a total of 200 rats and 200 mice for each compound. As early as 10 wk after initiation of treatment, both compounds induced a high incidence of squamous cell carcinomas of the stomach in both species. In addition, DBCP induced mammary adenocarcinomas in the female rats. These results are most pertinent to agricultural and food storage workers who disperse these volatile materials through soil or food. Although the hazard to any such workers would probably be largely through inhalation and not through oral exposure as was done in this study, anyone exposed to DBCP or EDB should take protective measures.

6060 A GENERAL THEORY OF CARCINOGENESIS. (E.) Comings, D. E. (City of Hope Natl. Med. Ctr., Duarte, Calif.). *Proc Natl Acad Sci USA* 70(12):3324-3328, 1973.

A general hypothesis of carcinogenesis is proposed. It is suggested that all cells possess multiple structural genes (*Tr*) capable of coding for transforming factors which can release the cell from its normal constraints on growth. In adult cells, they are suppressed by diploid pairs of regulatory genes and some of the transforming genes are tissue specific. The *Tr* loci are temporarily activated at some stage of embryogenesis and possibly during some stage of the cell cycle in adult cells. Spontaneous tumors, or tumors induced by chemicals or radiation, arise as the result of a double mutation of any set of regulatory genes releasing the sup-

pression of the corresponding *Tr* genes and leading to transformation of the cell. Autosomal dominant hereditary tumors, such as retinoblastoma, are the result of germ-line inheritance of one inactive regulatory gene. Subsequent somatic mutation of the other regulatory gene leads to tumor formation. The Philadelphia chromosome produces inactivation of one regulatory gene by position effect. A somatic mutation of the other leads to chronic myelogenous leukemia. Oncogenic viruses evolved by the extraction of host *Tr* genes with their conversion to viral transforming genes. As a result, in addition to the above mechanisms, tumors may also be produced by the reintroduction of these genes into susceptible host cells.

6061 CLEARANCE OF BENZO[a]PYRENE FROM HAMSTER LUNGS AFTER ADMINISTRATION ON COATED PARTICLES. (E.) Henry, M. C. (IIT Res. Inst., Chicago, Ill.) and D. G. Kaufman. *J Natl Cancer Inst* 51(6):1961-1964, 1973.

The persistence of benzo[a]pyrene (BP) in the respiratory tract of hamsters was determined after intratracheal instillation of the particulate dusts carbon, aluminum oxide, and ferric oxide (in the four size ranges 0.5-1, 2-5, 5-10, and 15-30 μ), each coated with BP. Because the 2% dust-2% carcinogen preparations were prepared on a weight basis, density differences required that more particles of carbon than of aluminum oxide or ferric oxide be given. Analysis of the BP content of hamster lungs immediately after instillation showed that the carbon preparations contained more carcinogen. BP was cleared much more slowly from lungs of carbon-treated animals, and there was a positive correlation between particle size and retention rate. The particles of aluminum oxide and ferric oxide retarded the clearance of the carcinogen, but retention rates did not correlate with particle size. The results demonstrate that the physical characteristics of the carrier dust on which BP is coated influence the penetration of the carcinogen and its retention in the respiratory tract.

6062 THE COCARCINOGENIC ACTIVITY OF SULFONOL NP-1. (Rus.) Sakharov, Iu. I. (A. N. Sysin Inst. Gen. Communal Hygiene, Moscow, USSR), Z. A. Pyleva and N. V. Sinigina. *Gig Tr Prof Zabol* (9):56-58, 1973.

Since dodecylbenzene accelerates the development of tumors induced by benzo(a)pyrene or 3-methylcholanthrene (3-MC), skin painting experiments were run on 118 male CBA x C57/B1 mice to determine whether the surfactant Sulfonol NP-1 (mixture of sodium salts of alkylbenzene sulfonic acids, sodium sulfate and non-sulfonated organic compounds), which is manufactured either from dodecylbenzene sulfonate or by polymerization of ethylene in the presence of sulfuric acid, also acts as a cocarcinogen. Mice were divided into four groups: those which (1) received local applications of a 20% benzene solution of Sulfonol NP-1 twice a wk for 35 wk; (2) a single application of a 0.5% benzene solution of 3-MC followed, three wk

later, by applications of a 20% benzene solution of Sulfonol NP-1 twice a wk on the same patch of skin for 35 wk; (3) a single application of 3-MC; or (4) benzene applications twice a wk for 35 wk. Mice were examined once a wk for development of papillomas and were weighed once every three wk. Beginning after the second or third application of Sulfonol NP-1, the skin of mice in group (1) became dry and thickened; desquamation and inflammation were noted in some cases. After 35 wk, 33 papillomas were found in 19 of the 27 mice in group (2); the first papilloma developed 15 wk after application of 3-MC when mice had received 96 mg of Sulfonol NP-1. None of the mice in groups (3) or (4) developed papillomas. These findings indicate that Sulfonol NP-1 has cocarcinogenic, but not carcinogenic, activity.

- 6063 TEST FOR CARCINOGENICITY OF FOOD ADDITIVES AND CHEMOTHERAPEUTIC AGENTS BY THE PULMONARY TUMOR RESPONSE IN STRAIN A MICE. (E.) Stoner, G. D. (Sch. Med., U. California, San Diego), M. B. Shimkin, A. J. Kniazeff, J. H. Weisburger, E. K. Weisburger and G. B. Gori. *Cancer Res* 33(12):3069-3085, 1973.

Forty-one food additives and 20 chemotherapeutic agents were examined for their ability to induce primary lung tumors in A mice. The animals received i.p. injections of each compound for 8 wk and were killed 24 wk after the first injection. With some of the more toxic compounds, fewer injections were administered. Two or three dose levels were used for each chemical. Cinnamyl anthranilate was the only agent of the 41 food additives tested which induced primary lung tumors. Safrole and sodium saccharin were negative for pulmonary tumor response under the conditions used. Of the 20 chemotherapeutic agents, including alkylating chemicals, 12 were found to be positive in inducing pulmonary tumors: uracil mustard, thio-TEPA, estradiol mustard, dibenzylamine, pyrimethamine, 5-azacytidine, β -deoxythioguanosine, isophosphamide, 1-propanol-3,3'-imino-dimethanesulfonate, phenesterin, imidazole mustard, and dapsone. Uracil mustard was the most active compound. Myleran was inactive at the dose levels used.

- 6064 PATTERN OF CHANGES PRODUCED IN THE PALATES OF FEMALE REVERSE SMOKERS OF CHUTTAS. (E.) Ramulu, C. (Andhra Med. Coll., Visakhapatnam-2, India) and C. R. R. M. Reddy. *Indian J Cancer* 10(2):191-198, 1973.

Biopsies were performed on the palates of 456 women who engaged in the practice of reverse smoking of chuttas (homemade cigars); 171 of the patients had carcinoma of the hard palate, with the hard palates of the others showing variations from no changes to stomatitis nicotina, to gross whitish thickening. The biopsied tissues were classified histologically as orthokeratotic, atypical, microinvasive carcinoma, frank invasive carcinoma, or hyperorthokeratotic lesions. Carcinoma of the hard palate occurred in younger women, with hyperorthokeratotic lesions occurring at about the same age. Mild atypism

occurred about 10 yr earlier than carcinoma, with microinvasive carcinoma occurring after atypia and before frank invasive carcinoma. The differences in the mean age of occurrence between the atypical lesions and carcinoma and between atypical lesions and the hyperorthokeratotic lesions were statistically significant. There was also a significant difference between the mean age of microinvasive carcinoma and frank invasive carcinoma. The incidence of hyperorthokeratosis increased as a function of duration of smoking, whereas atypism and carcinomas were seen after fewer years of smoking. It appears that stomatitis nicotina regresses to leucoplakia in women reverse smokers after many years of indulgence in the habit.

- 6065 A STUDY OF EXPERIMENTAL OVARIAN TUMORS PRODUCED IN RATS BY THE CHEMICAL CARCINOGEN, 20-METHYLCHOLANTHRENE. (E.) Kato, T. (Kurume U. Sch. Med., Japan), M. Yakushiji, A. Tsunawaki and K. Ide. *Kurume Med J* 20(3):159-167, 1973.

Surgical black silk suture soaked in 20-methylcholanthrene (20-MC) was sewn into the ovaries of 100 female Wistar rats. Among these animals, cystic tumors were produced in 15 cases and solid tumors appeared in 14 cases. The first tumors appeared 21 wk after the introduction of the treated sutures, and the incidence rate increased with time. The solid tumors consisted of sarcomas, adenocarcinomas and a granulosa cell tumor. Three of the sarcomas were successfully transplanted into other rats.

- 6066 INDUCTION OF BRAIN TUMORS IN THE DOG WITH METHYLNITROSOUREA. (Ger.) Schneider, J. (Med. Acad., Erfurt, Germany) and R. Warzok. *Z Gesamte Inn Med* 27(13):580-582, 1972.

Methylnitrosourea (MNU) was administered i.v. at 4-wk intervals to male and female mongrel dogs, aged four months to three yr, to determine whether this compound could produce neurogenic tumors in mammals other than rodents. Ten dogs received 20 mg/kg MNU in phosphate-buffered (pH 4.2) physiological saline until they died, while 13 others were given 12 injections of 15 mg/kg MNU in the same vehicle. Brain tumors were found in 7 of the 16 dogs that died (five in the group given 20 mg/kg and two in the group given 15 mg/kg). Dogs in these two groups had received between 1.778 and 4.274 g of MNU over periods of 315-555 days (mean 425 days). One dog had multiple brain tumors similar to those found in rabbits given MNU. Another dog had circumscribed cellular proliferation which apparently represented an early stage of a brain tumor. Extraneural, primarily mesenchymal, malignant neoplasms were present in various organs in five dogs in each group. Rapid cell proliferation was found in the blood vessels in almost all of the brains of dogs with tumors and in some of those without tumors. All dogs had multiple hemorrhages in the CNS, suggesting that cerebral blood vessels and the areas adjacent to them play an important role in the development of MNU-induced tumors in dogs. These vascular changes have not been found in MNU-induced tumors in rats or rabbits but have

been described in brain tumors induced by Rous sarcoma virus.

- 6067 PLEURAL MESOTHELIOMAS AND ASBESTOSIS.
(Fr.) Lanitis, G. (Cantonal Hosp., Lausanne, Switzerland), D. Waridel, F. Saegesser and D. Gardiol. *Helv Chir Acta* 40(5/6):635-640, 1973.

Of 19 pleural mesotheliomas observed in a 13-yr period, 11 were diffuse, one was multifocal and seven were localized. Most of the patients were 45-65 yr old, but one was a nine-yr-old girl with a diffuse multicoelomic form which extended into the peritoneal cavity and was accompanied by ascites and mediastinal compression. Of the 8 localized tumors, 5 were fibroblastic, 2 were mixed and 1 was epithelial, while of the 11 diffuse mesotheliomas, 6 were epithelial, 3 were mixed and 2 were sarcomatous. Two of these 19 patients had a history of exposure to asbestos; one of these patients also had asbestosis at autopsy. The latent periods in these two cases were 25 yr and 10 yr, resp.

- 6068 SOME CHARACTERISTICS OF THE TRANSCRIPTION PROCESS IN CELLULAR CHROMATIN IN THE LIVER DURING CHEMICAL CARCINOGENESIS. (Rus.) Mironov, N. M. (Inst. Exp. Clin. Oncol., Moscow, USSR) and V. V. Adler. *Biokhimiia* 38(5):992-998, 1973.

Male Wistar rats were fed a semisynthetic diet containing 0.06% of 3'-methyl-4-dimethylaminoazobenzene (3'MDAB) for various periods. Their livers were removed, homogenized and separated into chromatin and nuclear fractions. The activity of DNA-dependent RNA polymerase in the nuclei increased for several days after institution of treatment, but after one month had decreased to 60% of control values where it remained until the rats died. The rate at which exogenous RNA polymerase from *Escherichia coli* was bound by hepatic nuclei in 3'MDAB-treated rats was higher than in controls at all stages of carcinogenesis. The template activity of genetic material in the tumor was lower than in the normal liver when determinations were made with small amounts of RNA polymerase from *E. coli*. However, the template activity of nuclear deoxyribonucleoprotein (DNP) in liver nuclei from carcinogen-treated rats can exceed that of liver nuclei from controls in the presence of an excess of exogenous RNA polymerase. The template activity of DNP in tissue surrounding the tumor nodules was intermediate between that of liver from carcinogen-treated and control animals. This suggests that tissue surrounding the tumor is heterogeneous in its composition.

- 6069 INDUCTION OF TUBULAR STRUCTURES IN THE ENDOPLASMIC RETICULUM OF HUMAN LYMPHOID CELLS BY TREATMENT WITH 5-BROMO-2'-DEOXYURIDINE. (E.) Grimley, P. M. (Nat'l. Cancer Inst., Bethesda, Md.), D. W. Barry and Z. Schaff. *J Nat'l Cancer Inst* 51(6):1751-1760, 1973.

Treatment of suspension cultures of human lymphoid cells with the halogenated pyrimidine 5-bromo-2'-

deoxyuridine (BUDR) induced the formation of 20-28 nm diameter tubules within the endoplasmic reticulum. Up to 14% of the cell sections examined by electron microscopy were involved. This effect was dependent upon the concentration of BUDR in the culture medium and on the duration of treatment. The tubular structures appeared within 72 hr after suspension of the lymphoid cells in 20 µg/ml BUDR. The morphological response to BUDR was completely blocked by simultaneous treatment of the cultures with excess thymidine ($20 \times 10^{-5}M$). The cell lines tested originated from patients with infectious mononucleosis (PGLC) and Burkitt's lymphoma (Raji). These lines were known to be infected by Epstein-Barr virus, but herpes-type nucleocapsids or virions were never identified in the cells treated with BUDR. Ultrastructurally, the BUDR-induced tubules could not be distinguished from previously described "tubuloreticular structures" which appear clinically in the lymphocytes or vascular endothelial cells of patients with virus infection, systemic autoimmune diseases, or cancer, and which also occur spontaneously in some lymphocyte cultures from symptom-free individuals. Although the identity of tubuloreticular structures in patients and *in vitro* remains to be established by other than morphologic criteria, BUDR treatment of lymphoid cell cultures demonstrates that such structures can form selectively in response to a specific stimulus and provides an experimental model for further investigations.

- 6070 FINE STRUCTURE OF HEMANGIOENDOTHELIAL SARCOMAS IN THE RAT LIVER INDUCED WITH N-NITROSODIMETHYLAMINE. (E.) Hadjiolov, D. (Oncological Res. Inst., Bulgarian Acad. Sci., Sofia) and D. Markov. *Arch Geschwulstforsch* 42(2):120-126, 1973.

The fine structure of five dimethylnitrosamine induced-hemangioendothelial sarcomas of the Wistar rat liver was described. Atypical endothelial cells, which were actively involved in phagocytosis, were shown to possess fine processes and cytoplasmic vesicles. The cytoplasm of the nonphagocytic neoplastic endothelial cells was occupied by a very well developed network of the granular endoplasmic reticulum. The formation of definite basement membranes surrounding the vascular channels and intercellular vascular spaces was encountered. Despite their immaturity, the tumor endothelial cells demonstrate in the liver various expressions of cellular differentiations including the formation of well defined basement membranes.

- 6071 THE EFFECTS OF DIETHYLNITROSAMINE ON RIBONUCLEIC ACID AND PROTEIN SYNTHESIS IN THE LIVER AND LUNG OF THE SYRIAN GOLDEN HAMSTER. (E.) Witschi, H. (Fac. Med., U. Montreal, Quebec, Canada). *Biochem J* 136(3):789-794, 1973.

The effect of a single s.c. dose of diethylnitrosamine (DENA, 200 mg/kg) on the incorporation of isotopically labeled precursors into lung and liver RNA and protein was studied in male Syrian golden hamsters. Significant differences were found between the two organs. DENA produced an early inhibition

of orotic acid and leucine incorporation into hepatic RNA and protein, resp., and significantly lowered basal and 20-methylcholanthrene-stimulated activities of hepatic aryl hydrocarbon hydroxylase. In the lung, however, DENA affected only protein synthesis. Incorporation of thymidine into DNA was inhibited in both liver and lung for 2-3 days following DENA injection. The extensive DENA-induced biochemical effects seen in the liver were presumably due to the extensive drug-induced organ necrosis which was not seen in the lung.

- 6072 CYTOCHROME P-450 CONTENT AND THE ABILITY OF LIVER MICROSOMES FROM PATIENTS UNDERGOING ABDOMINAL SURGERY TO ALTER THE MUTAGENICITY OF A PRIMARY AND A SECONDARY CARCINOGEN. (E.) Czygan, P. (Mount Sinai Sch. Med., City U. New York, N.Y.), H. Greim, A. J. Garro, F. Hutterer, J. Rudick, F. Schaffner and H. Popper. *J Natl Cancer Inst* 51(6):1761-1764, 1973.

The capacity of microsomes isolated from livers of 29 patients undergoing abdominal surgery to alter the mutagenicity of a primary and a secondary carcinogen was investigated and related to the cytochrome P-450 content of the liver. In nine patients studied, such microsomes activated the mutagenic effect on bacteria of the secondary carcinogen dimethylnitrosamine and inactivated that of the primary carcinogen *N*-methyl-*N*-nitro-*N*-nitrosoguanidine. The differential ability of microsomes to alter mutagenicity varied in parallel with cytochrome P-450 content. This suggests great variability in the capacity of patients examined to metabolize carcinogens by their microsomes.

- 6073 CARCINOGEN HAZARD IN THE SYNTHESIS OF SUBSTRATES. (E.) Tsou, K. C. (U. Pennsylvania, Sch. Med., Philadelphia). *J Histochem Cytochem* 21(9):836, 1973.

- 6074 THE *N*-OXIDATION OF ALKYLHYDRAZINES CATALYZED BY THE MICROSOMAL MIXED-FUNCTION AMINE OXIDASE. (E.) Prough, R. A. (U. Texas Southwestern Med. Sch., Dallas). *Arch Biochem Biophys* 158(1):442-444, 1973.

- 6075 AFLATOXIN AND NITROGEN BALANCE IN THE YOUNG CALF. (E.) Lynch, G. P. (Agricultural Res. Station, Nutrition Inst., Beltsville, Md.), D. F. Smith, F. C. Covey and C. H. Gordon. *J Dairy Sci* 56(9):1154-1158, 1973.

- 6076 ISOENZYMES OF LACTATE, MALATE, AND GLUCOSE-6-PHOSPHATE DEHYDROGENASE IN EXPERIMENTAL SUBMAXILLARY GLAND TUMORS. (E.) Yoshimura, Y. (Osaka U. Dental Sch., Japan), T. Kawano, M. Morishita, K. Kawakatsu and M. Mori. *Gann* 64(5):441-447, 1973.

- 6077 EFFECTS OF AFLATOXIN ON SEEDLING GROWTH AND ULTRASTRUCTURE IN PLANTS. (E.) Crisan, E. V. (Dept. Food Sci. Technol., U. California, Davis). *Appl Microbiol* 12(6):991-1000, 1973.

- 6078 FINE STRUCTURAL CHANGES AND AUTORADIOGRAPHIC STUDIES OF RAT LIVER CELLS INDUCED BY AFLATOXIN B₁ AND G₁. (E.) Kim(Roe), C. S. (Yonsei U. Coll. Med., Seoul, Korea), D. S. Kim and Y. B. Lee. *Yonsei Med J* 13:1-17, 1973.

- 6079 A SCREENING PROCEDURE FOR *EUPHROBIA* CO-CARCINOGENIC IRRITANTS. (E.) Evans, F. J. (Sch. Pharmacy, U. London, England) and A. D. Kinghorn. *J Pharm Pharmacol Suppl* 25:145P, 1973.

- 6080 THE EFFECT OF DIFFERENT CYCLOPHOSPHAMIDE DOSES ON THE IMMUNE RESPONSE OF MICE WITH METHYLCHOLANTHRENE INDUCED SARCOMA. (Rus.) Gordienko, S. P. (P.A. Herzen Res. Inst. Oncol., Moscow, USSR) and V. M. Bergoljts. *Vopr Onkol* 19(11):54-60, 1973.

- 6081 CARCINOGENICITY OF COPROSTEROL, AN INTES-TINAL PRODUCT OF CHOLESTEROL REDUCTION. (Ger.) Pfeiffer, E. H. (Hyg. Inst., U. Mainz, Germany). *Naturwissenschaften* 60(11):525-526, 1973.

- 6082 CARCINOGENESIS IN ISOTRANSPLANTED RESPIRATORY FRAGMENTS FROM BALB/c/Cb/Se MICE TREATED WITH HYDRAZINE. (It.) Biancifiore, C. (Inst. Anat. Pathol. Histol., U. Perugia, Italy). *Lav Ist Anat Istol Patol Perugia* 33(1):17-26, 1973.

- 6083 AFLATOXIN-SOLVENT INTERACTIONS INDUCED BY ULTRAVIOLET LIGHT. (E.) Wei, R. -D. (Dept. Food Sci., U. Wisconsin, Madison) and F. S. Chu. *Assoc Offic Anal Chem* 56(6):1425-1430, 1973.

- 6084 CYTOPHOTOMETRIC STUDY OF CHANGES IN HEPATIC NUCLEI AFTER THIOACETAMIDE TREATMENT. (Fr.) Thienpont, L. (U. Hosp., Natl. U., Ghent, Belgium). *CR Soc Biol* 167(6/7):1058-1064, 1973.

- 6085 POTENTIALLY CARCINOGENIC CYCLOPENTA [A]PHENANTHRENES. PART VIII. BROMINATION OF 17-KETONES. (E.) Coombs, M. M. (Imperial Cancer Res. Fund, London, England), M. Hall and C. W. Vose. *J Chem Soc Perkin I* 2236-2240, 1973.

- 6086 A PROBLEM OF NOMENCLATURE (II): FREUND'S ADJUVANTS. (E.) Whitehouse, M. W. (Dept. Experimental Pathol., John Curtin Sch. Med. Res., Australian Natl. U., Canberra). *Agents Actions* 3-4:221-222, 1973.

- 6087 CHARACTERISTICS OF BLASTOMOGENESIS INDUCED WITH TRYPTOPHANE METABOLITES. (Rus.) Zharova, E. I. (Inst. Exp. Clin. Oncol., Moscow, USSR). *Patol Fiziol Eksp Ter* (2):54-58, 1973.
- 6088 EXPERIMENTAL BLASTOMOGENESIS UNDER CONDITIONS OF CHANGED WATER REGIMEN. (Rus.) Arkhipenko, V. I. (Dnepropetrovsk Med. Inst., USSR) and L. F. Kos. *Patol Fiziol Eksp Ter* (2):71-72, 1973.
- 6089 DETERMINATION OF BENZO(a)PYRENE IN MINERAL TARS FOR PHARMACEUTICAL USE. (It.) Manzone, A. M. (Higher Inst. Hlth., Rome, Italy) and C. Rossi. *Tumori* 59(4):295-302, 1973.
- 6090 LEAD-INDUCED RENAL CARCINOMA. (E.) Coogan, P. S. (No affiliation). *Proc Inst Med Chic* 29(9):309, 1973.
- 6091 AROMATIC AMINE-INDUCED URINARY BLADDER CARCINOMA. (E.) Hsu, G. Y. (No affiliation). *Proc Inst Med Chic* 29(9):309, 1973.
- 6092 CHEMICALLY-INDUCED BREAST CARCINOMA. (E.) McClain, E. D. (No affiliation). *Proc Inst Med Chic* 29(9):310, 1973.
- 6093 EFFECT OF NITROGEN AND OF CATALASE ON HYDROXYLAMINE AND HYDRAZINE MUTAGENESIS. (E.) Chu, B. C. F. (Chem. Lab., U. Cambridge, England), D. M. Brown and M. G. Burdon. *Mutat Res* 20(2):265-270, 1973.
- 6094 CYSTATHIONASE ACTIVITY IN THE LIVER OF RATS TREATED WITH 7, 12-DIMETHYLBENZ(a)ANTHRACENE. (Fr.) Bernard, P. (Lab. Biochem., U. Paris, France), A. Hirsch and F. Chatagner. *C R Acad Sci Paris* 277(22):2589-2592, 1973.
- 6095 PRESENCE OF TWO TYPES OF CELLS IN ADENOMAS OF THE RAT THYROID. (Fr.) Stoll, R. (Lab. Biol., U. Bordeaux II, France), R. Maraud, N. Faucounau and D. Stoll. *Pathol Eur* 8(2):135-141, 1973.
- 6096 VIRUS-LIKE PARTICLES IN METASTASES OF MALIGNANT ORAL MELANOMAS IN DOGS. (E.) Frese, K. (Vet. Pathol. Inst., Univ. Giessen, Germany). *Naturwissenschaften* 60(1):55, 1973.
- 6097 TRANSPLANTATION OF ETHYLNITROSOUREA - INDUCED SCHWANNOMAS IN THE HARVARD RAT. (E.) Ridley, A. (London Hosp., England), P. Kennedy and S. Rainbird. *Acta Neuropathol* 26(2):139-146, 1973.
- 6098 INDUCTION OF CROWN GALL BY NITROSOGUANIDINE-TREATED *AGROBACTERIUM TUMEFACIENS*. (E.) Davis, C. H. (Dept. Biol. California State U., San Diego) and R. H. Rothman. *Mutat Res* 20(2):283-285, 1973.
- 6099 SELECTIVE INDUCTION OF MALFORMATIONS BY AZOXYETHANE DURING EARLY DEVELOPMENT IN THE RAT. (Ger.) Griesbach, U. (Max Planck Inst. Brain Res., Cologne, W. Germany). *Naturwissenschaften* 60(12):555, 1973.
- 6100 2-[3-(9-ACRIDINYLAMINO)-PROPYLAMINO]ETHANOL (ICR-449-OH), AN ANALOGUE OF A MUTAGEN. (E.) Glusker, J. P. (Inst. Cancer Res., Philadelphia, Pa.), B. Gallen and H. L. Carrell. *Acta Cryst (B)* 29(9):2000-2006, 1973.
- 6101 VULVAR CARCINOMA *IN SITU* IN IDENTICAL TWINS - AN OCCUPATIONAL HAZARD. (E.) Friedrich, E. G., Jr. (Med. Coll. Wisconsin, Milwaukee). *Obstet Gynecol* 39(6):837-841, 1972.
- 6102 METHOD FOR THE DETERMINATION OF AFLATOXIN IN ANIMAL TISSUE. (E.) Brown, N. L. (Div. Chem. Phys., FDA, Washington, D. C.), S. Nesheim, M. E. Stack and G. M. Ware. *Assoc Official Anal Chem* 56(6):1437-1439, 1973.
- 6103 EARLY STAGES IN ESTROGEN CONTROL OF GENE EXPRESSION AND ITS DERANGEMENT IN CANCER. (E.) Bresciani, F. (Fac. Med. Surg., Univ. Naples, Italy), E. Nola, V. Sica and G. A. Puca. *Fed Proc* 32(11):2126-2132, 1973.
- 6104 HYDROXYLAMINE-O-SULFONIC ACID: *IN VITRO* AND POSSIBLE *IN VIVO* REACTION WITH DNA. (E.) Rosenkranz, H. S. (Coll. Phys. Surg., Columbia Univ., New York, N.Y.). *Chem Biol Interact* 7(4):195-204, 1973.
- 6105 EFFECTS OF RUBRATOXIN B ON PRENATAL DEVELOPMENT IN MICE. (E.) Hood, R. D. (Dept. Biol., Univ. Alabama, University), J. E. Innes and A. W. Hayes. *Bull Environ Contam Toxicol* 10(4):200-207, 1973.
- 6106 EFFECTS OF ORALLY INGESTED AFLATOXIN B₁ ON NUCLEIC ACIDS AND RIBOSOMES OF HOUSEFLY OVARIES. (E.) Al-Adil, K. M. (Dept. Environ. Toxicol., Univ. California, Davis), W. W. Kilgore and R. R. Painter. *Toxicol Appl Pharmacol* 26(1):130-136, 1973.
- 6107 NITROSAMINES: UBIQUITOUS CARCINOGENS? (E.) Magee, P. (Courtauld Inst. Biochem., London, England). *New Scientist* 59(860):432-434, 1973.

6108 THE ROLE OF 3-OH BENZO(A)PYRENE IN MEDIATING BENZO(A)PYRENE INDUCED TOXICITY AND TRANSFORMATION IN CELL CULTURE. (E.) Lubet, R. A. (Southwestern Med. Sch., Dallas, Tex.), D. Q. Brown and R. E. Kouri. *Res Commun Chem Pathol Pharmacol* 6(3):929-942, 1973.

6109 SUPPRESSION BY VITAMINS D₂ AND D₃ OF HAMSTER CHEEK POUCH CARCINOMA INDUCED WITH 9,10-DIMETHYL-1,2-BENZANTHRACENE. WITH A DISCUSSION OF THE ROLE OF INTRACELLULAR CALCIUM IN THE DEVELOPMENT OF TUMORS. (E.) Rubin, D. (Hadassah Univ. Hosp., Jerusalem, Israel) and I. S. Levij. *Pathol Microbiol* 39(6):446-460, 1973.

6110 MASS SPECTRA OF CARCINOGENIC 4-HYDROXYLAMINOQUINOLINE N-OXIDES. (E.) Bosin, T. R. (Med. Sci. Program, Indiana Univ., Bloomington) and R. P. Maickel. *Res Commun Chem Pathol Pharmacol* 6(3):813-820, 1973.

6111 MUTAGENICITY STUDIES WITH 6-MERCAPTOPYRIMIDINE: I. CYTOGENETIC ACTIVITY *IN VIVO*. (E.) Holden, H. E. (Pfizer Med. Res. Labs., Groton, Conn.), V. A. Ray, M. G. Wahrenburg and J. D. Zelenski. *Mutat Res* 20(2):257-263, 1973.

6112 ENHANCEMENT BY CAFFEINE OF *N*-METHYL-*N*-NITROSOUREA-INDUCED MUTATIONS AND CHROMOSOME ABERRATIONS IN CHINESE HAMSTER CELLS. (E.) Roberts, J. J. (Roy. Cancer Hosp., London, England) and J. E. Sturrock. *Mutat Res* 20(2):243-255, 1973.

See also:

- * (Rev): 6010, 6019, 6025
- * (Viral): 6127, 6198
- * (Immun): 6208
- * (Epid-Biom): 6270, 6276

- 6113 MODIFICATIONS OF THE THYMIC CELL POPULATION DURING THE DEVELOPMENT OF THE RADIATION-INDUCED LYMPHOMA IN MICE. (E.) Boniver, J. (Lab. Anat. Path., U. Liege, Belgium), M. Delrez, L. J. Simar and J. Haot. *Beitr Pathol* 150(3):229-245, 1973.

The morphological changes in the thymus during radioleukemogenesis in C57B1 mice were studied on an ultrastructural level. Blast cells similar to previously described immature lymphoid cells accumulated after fractionated irradiation. The blast cell population was heterogeneous, consisting of some typical lymphoblasts and a large number of cells with ring shaped nucleoli and X cells; the numbers of the two cell types were inversely correlated. The X cells were identical to the X cells appearing in the bone marrow following a single exposure to radiation. All of the blast cells remained in the thymus during the preleukemic period; they were particularly numerous in the late atrophic thymus and were still present in the lymphomas. It is likely that the X cells, cells with ring shaped nucleoli, and perhaps the lymphoblasts are blast cells belonging to the same cell line; there is evidence of the existence of transitional stages between these different cell types. These cells may play a role in leukemogenesis as target cells for the oncogenic virus.

- 6114 CHROMOSOMAL ABERRATION OF HUMAN LEUKOCYTES EXPOSED *IN VITRO* TO RADIATION IN RELATION TO DOSE OF X-RAY AND AGE OF CULTURE. (Pol.) Slowikowska, M. G. (State Inst. Hygiene, Warsaw, Poland) and W. J. Grzymala. *Roczn PZH* 24(6):755-761, 1973.

Heparinized peripheral blood from five adults was irradiated *in vitro* at 20 C with 0, 12, 24, 48, 96, 192, 388 and 768 R. PHA-M stimulated lymphocyte cultures from this blood were examined after 56 and 72 hr. It was found that the percentage of cells with chromosomal aberrations increased with increasing dose and was markedly higher in the 56 hr culture than in the 72 hr culture (gradually increasing from 9.2% with 12 R to 70.4% with 768 R after 56 hr as compared to 10% and 40% resp. after 72 hr of culture). While the mean number of chromosomal aberrations such as acentric fragments, di- and tri-centric chromosomes and rings was almost twice as high in the 56 hr as in the 72 hr culture, the chromatid aberrations were somewhat higher in the 72 hr culture. It is concluded that for the assessment of post-irradiation damage, cell cultures should be examined during the first post-irradiation mitosis.

- 6115 X-RAY-INDUCED STIMULATION OF LEUKEMOGENESIS IN AKR AND AKR/T1 Ald MICE. (Fr.) Leonard, A. (Dept. Radiobiol., Ctr. Study Nuclear Energy, Mol, Belgium), G. Deknudt and G. Linden. *C R Soc Biol (Paris)* 167(6/7):1055-1057, 1973.

The incidence and latent period, measured by the mean lifespan, of spontaneous and radiation-induced lymphoid leukemia were studied in 50 male and female AKR and AKR/T1 Ald mice. The latter substrain of

mice has 36 acrocentric and 2 submetacentric chromosomes in contrast to the normal complement of 40 acrocentric chromosomes found in AKR mice. Whole-body x-irradiation consisted of four doses of 175 r, administered at 7-day intervals, starting 30 days after birth. In both AKR and AKR/T1 Ald mice the mean lifespan of males was significantly longer than that of females. Both male and female AKR/T1 Ald mice had significantly shorter mean lifespans than AKR males and females, resp. Exposure to radiation shortened the lifespans of both AKR and AKR/T1 Ald mice by 25-30%. The incidence of leukemia was the same in irradiated and nonirradiated mice. Among nonirradiated controls, the incidence of leukemia appeared to be slightly higher in AKR/T1 Ald than in AKR mice, but these differences disappeared after irradiation. Thus, the spontaneous chromosome anomaly in AKR/T1 Ald mice appears to be associated with a slight increase in the incidence of leukemia and a significant decrease in the latent period. These differences may be due to the use of mice of different origin. The AKR mice had been recently acquired from Great Britain, while the AKR/T1 Ald mice originally came from the USA but had been raised in Belgium for more than ten yr.

- 6116 CARCINOGENICITY OF INHALED PLUTONIUM-238 IN THE RAT. (E.) Sanders, C. L., Jr. (Battelle-Pacific Northwest Labs., Richland, Wash.). *Radiat Res* 56(3):540-553, 1973.

Three groups of female Sprague-Dawley rats were exposed to an aerosol of "soluble" ^{238}Pu derived from crushed $^{238}\text{PuO}_2$ microspheres suspended in physiological saline. Initial alveolar burdens of ^{238}Pu were 5 nCi (Group I), 18 nCi (Group II), and 207 nCi (Group III). Only 1% of the initial alveolar lung burden remained in the lung at 1 yr, decreasing to 0.3% by 600 days after exposure. The ^{238}Pu body burden was 25% of the initial alveolar burden at 1 yr, decreasing to 12% by 1000 days after exposure; about half of the body burden was found in the skeleton at these times. The cumulative radiation doses to the lung at 2 yr after exposure were 9 rads (I), 32 rads (II), and 375 rads (III). Unexposed controls exhibited a median survival time of 825 days as compared to experimental survival times of 650 days (I), 675 days (II), and 550 days (III). The incidence of lung tumors in controls was 1.1% as compared to incidences in ^{238}Pu -exposed rats of 6.6% (I), 20.0% (II), and 25.0% (III). The incidence of all tumors other than mammary tumors was 4.3% in unexposed controls and 26.7% (I), 36.6% (II), and 46.8% (III) in the ^{238}Pu -exposed rats.

- 6117 LACTATE DEHYDROGENASE ACTIVITY IN THE EPIDERMIS OF MOUSE EAR EXPOSED TO MONOCHROMATIC WAVELENGTHS OF ULTRAVIOLET LIGHT. (E.) Ogura, R. M. (Baylor Coll. Med., Houston, Tex.), H. S. Black and J. M. Knox. *J Invest Dermatol* 61(5):310-313, 1973.

6118 GENETIC DUPLICATIONS INDUCED AT VERY
HIGH FREQUENCY BY ULTRAVIOLET IRRADIA-
TION IN *ESCHERICHIA COLI*. (E.) Hill, C. W.
(Pennsylvania State U., Hershey Med. Ctr.) and
G. Combrato. *Mol Gen Genet* 127(3):197-214,
1973.

See also:

- * (Rev): 6004
- * (Chem): 6036, 6060, 6083
- * (Viral): 6198
- * (Path): 6260

- 6119 CASE-CONTROL STUDY OF HODGKIN'S DISEASE. II. HERPESVIRUS GROUP ANTIBODY TITERS AND HL-A TYPE. (E.) Henderson, B. E. (U. Southern California Sch. Med., Los Angeles), R. Dworsky, H. Menck, B. Alena, W. Henle, G. Henle, P. Terasaki, G. R. Newell, W. Rawlings and B. K. Kinnear. *J Natl Cancer Inst* 51(5):1443-1447, 1973.

Blood samples collected from 142 patients with Hodgkin's disease and 142 matched clinic controls were analyzed for antibodies to members of the herpesvirus group and for HL-A typing. Antibody titers to Epstein-Barr virus (EBV) were significantly elevated in the Hodgkin's patients, and tended to be higher in females and in older and married persons. Higher EBV titers were observed in Hodgkin's disease patients with the mixed-cellularity, lymphocyte-predominant, and nodular-sclerosis subtypes. Varicella antibody titers were also significantly elevated in Hodgkin's patients as compared with matched and spouse controls, but not sibling controls. In addition, the varicella antibody titers were higher in young patients, while cytomegalovirus and herpes simplex I followed a pattern similar to that for EBV. There was no variation in the titers of any of these antibodies with Hodgkin's subtype. The Hodgkin's patients had a significantly increased frequency of HL-A 1; there were no apparent differences in the distribution of HL-A frequency by histologic subtype.

- 6120 EFFECT OF DIBUTYRYL CYCLIC AMP ON THE INDUCTION OF EPSTEIN-BARR VIRUS IN HYBRID CELLS. (E.) Zimmerman, J. E., Jr. (Milton S. Hershey Med. Ctr., Pennsylvania State U., Hershey), R. Glaser and F. Rapp. *J Virol* 12(6):1442-1445, 1973.

The treatment of Epstein-Barr virus (EBV) negative somatic cell hybrids with 5'-iododeoxyuridine (IUdR) induced the synthesis of EBV antigens and virus particles. When dibutyryl cAMP (Bt₂-cAMP) was present in the medium after exposure of the cultures to IUdR, the incidence of cells synthesizing EBV early and virus capsid antigens was increased. The time necessary for the appearance of EBV particles after induction by IUdR was significantly reduced in the presence of Bt₂-cAMP. This enhancement was evident to a lesser degree with 3':5' cAMP than with Bt₂-cAMP and did not occur with any other of the related compounds tested. The response observed was dose dependent. Untreated (no IUdR) EBV negative hybrid cells exposed to Bt₂-cAMP also synthesized EBV antigens. The concentration of intracellular cAMP may act as one of the control mechanisms selecting for gene expression in this system.

- 6121 REVERSE TRANSCRIPTASE ACTIVITIES IN PLASMA FROM A PATIENT WITH BREAST CANCER. (Ger.) Rainer, H. (1st Med. Clin., U. Vienna, Austria), G. Piller, E. Deutsch and K. Moser. *Klin Wochenschr* 51(21):1076-1078, 1973.

Evidence of reverse transcriptase activity was found in the plasma of a 61-yr-old woman who presented

with an ulcerated solid carcinoma simplex of the left breast and bone, liver and lymph node metastases. The patient had never been given glucocorticoids or cytostatic agents. The enzyme was isolated by reacting purified plasma with 2 mM dithiothreitol and 10% glycerol; chromatographing on DEAE cellulose, phosphocellulose, Sephadex G-200 and hydroxyapatite; and subjecting the material obtained to ultracentrifugation in a glycerol gradient (20-60%). RNA-sensitive incorporation of ¹⁴C-labeled TTP was found in the DNA fraction precipitated with acid. The enzyme met all kinetic criteria which have been established for reverse transcriptase. Other studies by these authors have revealed that a similar enzyme is present in some patients with malignancies but not in other diseases. The findings suggest that the method used for detecting the enzyme is successful only at a relatively late stage of the disease and in only a small number of patients, but no explanation was found for the presence of reverse transcriptase activity in plasma from some patients with malignant diseases but not in others.

- 6122 PARTICLES WITH RNA OF HIGH MOLECULAR WEIGHT AND RNA-DIRECTED DNA POLYMERASE IN HUMAN BRAIN TUMORS. (E.) Cuatrecasas, W. (Coll. Physicians Surgeons, Columbia U., New York, N.Y.), J.-R. Cho and S. Spiegelman. *Proc Natl Acad Sci* 70(10):2789-2793, 1973.

The simultaneous detection test was used to study the etiology of human brain tumors. Fifty-one human brain tumors and 13 samples of histologically normal human brain tissue were analyzed. The tumors were found to contain 70S RNA and RNA-directed DNA polymerase encapsulated in a particulate component with a density of 1.17 g/ml; these particles could not be detected in any of the nonneoplastic tissues. The (3H)DNA synthesized by the brain tumor particles showed no detectable homology to the RNAs of avian myeloblastosis virus, Rous sarcoma virus, Rauscher leukemia virus, mouse mammary tumor virus, or visna virus; the particles did, however, satisfy the criteria which characterize RNA tumor viruses of animals. In some cases, enough tumor particles were present to permit hybridization tests; in such cases, homology was observed with the polysome RNA fraction from the same or similar tumor. The highest incidence of tumor particles were found in the following highly malignant tumors: glioblastoma multiforme, medulloblastoma, optic glioma, and oligodendroglioma. The particles were much less common in the following less malignant tumors: ependymoma, meningioma, and schwannoma.

- 6123 IMMUNOFLUORESCENCE AND IMMUNOELECTRON MICROSCOPY OF VIRUS-INDUCED MAMMARY TUMORS IN MOUSE LINE CBA/B1n. (Rus.) Zotter, S. (Carl Gustav Carus Med. Acad., Dresden, Germany), M. Muller and C. Kemmer. *Vopr Onkol* 19(11):22-28, 1973.

By using the indirect immunofluorescence test with syngeneic, allogeneic and xenogeneic antisera, it has been demonstrated that cross-reacting antigens to

murine mammary tumor virus (MTV) are present in many tumors in CBA/B1n mice infected with MTV and in sera of mice immunized with MTV. This antigen is not identical with virions or virus particles of mouse MTV. Although the antigen content remained relatively constant over a long period in some tumors, in one tumor antigen only began to appear with the sixth mouse passage, and no evidence of virus particles has yet been detected with the electron microscope. Tumors containing no virus particles apparently do contain the viral genome and virus-coding surface antigens. Another tumor which used to produce virus and underwent sarcomatous degeneration still has no evidence of antigen.

- 6124 HIGH RESOLUTION AUTORADIOGRAPHIC STUDY OF THE KINETICS OF DEVELOPMENT OF ROUS SARCOMA VIRUS (SCHMIDT-RUPPIN STRAIN). V. ESTIMATION OF THE TIME OF SYNTHESIS OF VIRUS-ASSOCIATED DNA. (E.) Michelson-Fiske, S. (Exp. Med. Lab., Coll. France, Paris), F. Haguénau and G. F. Rabotti. *J Natl Cancer Inst* 51(6):1927-1933, 1973.

The kinetics of synthesis of Rous sarcoma virus (RSV)-associated DNA was examined in cell cultures. Chick embryo fibroblasts transformed by RSV were labeled with ^3H -thymidine; this precursor was incorporated into the extracellular virus as early as ten min after contact of the cells with the precursor. With electron microscope autoradiography, the DNA was detectable at the level of the budding and mature particles after ten min of pulse labeling and two hr of chase. After the virus was purified on sucrose gradients and its nucleic acids were extracted, radioactivity was found in an acid-precipitable material. This material was resistant to NaOH hydrolysis and RNase treatment, but sensitive to DNase digestion.

- 6125 ANTIBODY PATTERNS TO *HERPESVIRUS SAIMIRI*-INDUCED ANTIGENS IN OWL MONKEYS. (E.) Pearson, G. R. (Natl. Cancer Inst., Bethesda, Md.), T. Orr, H. Rabin, J. Cicmanec, D. Ablashi and G. Armstrong. *J Natl Cancer Inst* 51(6):1939-1943, 1973.

Antibody-response patterns to three major groups of *Herpesvirus saimiri* (HVS)-associated antigens [early antigens (EA), late antigens (LA), membrane antigens (MA)] in ten owl monkeys infected with HVS were related to the clinical course of HVS-induced disease. Results are also presented which show that EA is produced four to eight hr earlier than LA in HVS-infected cells providing further evidence that these are two distinct groups of antigens. In animals that developed neoplasms, antibodies against all three groups of antigens were found; however, the antibody response to EA was delayed, in general, two to four wk compared with the responses to LA and MA. Two owl monkeys inoculated with HVS and one inoculated with HVS-induced tumor cells did not develop gross or clinical signs of disease; antibodies to LA and MA, but not EA, were detected in serum samples from these monkeys. These results provide additional evidence that the antibody response to EA may indicate lymphoproliferation (or

cell transformation). The presence of antibody to LA and MA denotes exposure to the virus but not necessarily the presence of disease.

- 6126 LYMPHOCYTES IN INFECTIOUS MONONUCLEOSIS: PROPERTIES OF ATYPICAL CELLS AND ORIGIN OF THE LYMPHOBLASTOID LINES. (E.) Yata, J. (Internatl. Agency Res. Cancer, Biol. Carcinogenesis Unit, Lyon, France), C. Desgranges, G. de-The and T. Tachibana. *Biomedicine* 19(11):479-483, 1973.

T and B cell markers were used to investigate the nature of the atypical lymphocytes in infectious mononucleosis (IM) and the origin of lymphoblastoid cell lines established from IM blood leukocytes. The atypical lymphocytes in the IM peripheral blood formed spontaneous rosettes with sheep erythrocytes, were positive for human thymus-lymphoid tissue antigen, and did not react with erythrocyte-antibody-complement complex; thus the IM atypical lymphocytes are probably T cells. Leukocytes from the peripheral blood of IM patients established lymphoblastoid lines when cultured *in vitro*. When subpopulations of these lymphocytes were cultured, only B-cell populations gave rise to lymphoblastoid lines, whereas spontaneous rosette forming cells (T cells) did not grow in culture. Thus, the cells proliferating *in vitro* are probably not the progeny of the atypical lymphocytes characteristically observed in the blood of IM patients.

- 6127 SELECTION OF TUMOR-HOST CELL HYBRIDS FROM POLYOMA VIRUS- AND METHYLCHOLANTHRENE-INDUCED SARCOMAS. (E.) Fenyö, E. M. (Dept. Tumor Biol., Karolinska Inst., Stockholm, Sweden), F. Wiener, G. Klein and H. Harris. *J Natl Cancer Inst* 51(6):1865-1875, 1973.

Tumor-host cell hybrids were isolated *in vitro* from two polyoma-induced ascites sarcomas and one methylcholanthrene-induced sarcoma by selection of surface-adherent cell colonies. The loosely attached tumor cells were removed by shaking or mild trypsinization. A difference in the sensitivity of the tumor cells and the tumor-host cell hybrids to Colcemid treatment provided an additional tool for selection. The hybrids were identified by chromosomal and antigenic markers. Several hybrid lines derived from the fusions between tumor cells and host cells *in vivo* were tested for their ability to grow progressively in F_1 hybrid hosts; they were all tumorigenic. The chromosomal constitution of the tumors approximated that of the corresponding line *in vitro*.

- 6128 CELL RECOGNITION AND PHAGOCYTOSIS OF SV40 TRANSFORMED CELL. (E.) Kimoto, T. (Okayama U. Med. Sch., Japan). *Acta Path Jap* 23(2):291-305, 1973.

Previous studies have indicated that during the course of cell transformation by simian virus 40 (SV40), the cell membrane undergoes changes which cause its surface to become negatively charged;

the phagocytosis of negatively charged substances is thereby markedly decreased. The relationship between SV40-transformed hamster cells and allogeneous hamster red cells (RBC) and lymphocytes was studied. The results indicated that the rates of adhesion to and ingestion of native cells by the transformed cells, which recognize the former as self, are low. However, when the native cells were previously treated with half saturated ammonium sulfate and 2.5% glutaraldehyde to change the charge on the cell membrane, a marked phagocytosis was triggered. When the L cells were coated with nonimmune albumin or immune sera (anti-RBC-rabbit sera), the phagocytosis was inhibited, while phagocytosis by the transformed cells remained unchanged. The phagocytosis of transformed cells was inhibited by treating the transformed cells or fixed RBC with Concanavalin A. Phagocytosis by the transformed cells was greatly enhanced when native spleen cells infected with Rauscher virus were used. Thus, the cell recognition of self or nonself by cancer cells depends upon changes in the cell surface charges of both cell groups due to molecular architecture.

- 6129 *IN VITRO* TRANSCRIPTION OF THE VIRAL-SPECIFIC SEQUENCES PRESENT IN THE CHROMATIN OF CELLS TRANSFORMED BY SIMIAN VIRUS 40. (E.) Shih, T. Y. (Natl. Inst. Hlth., Bethesda, Md.), G. Khoury and M. A. Martin. *Proc Natl Acad Sci USA* 70(12): 3506-3510, 1973.

Separated strands of simian virus 40 (SV40) DNA fragments in hybridization experiments to study the RNA transcribed by *Escherichia coli* RNA polymerase from the chromatin of mouse embryo cells transformed by SV40. The template activity of the chromatin of the transformed cell line 11A8 (mouse-embryo cells) examined is about 17% that of purified DNA, suggesting that most of the chromatin DNA is repressed by chromosomal proteins. The SV40-specific RNA present in the RNA transcribed *in vitro* from 11A8 chromatin hybridizes specifically with the minus strand of SV40 DNA. Little or no reaction occurs with the plus strand of viral DNA. The SV40-specific RNA transcribed *in vitro* from the chromatin of transformed cells shares sequences with the RNA produced during the early phase of SV40 lytic infection, and is similar to that present in the 11A8 cell line *in vivo*. Although the influence of chromosomal proteins on this pattern of transcription was not definitely determined, preliminary evidence indicates that an asymmetric pattern of transcription may also occur when 11A8 DNA is transcribed by *E. coli* RNA polymerase.

- 6130 EFFECT OF ADENOVIRUS SOLUBLE ANTIGENS ON VIRUS SYNTHESIS AND TRANSFORMATION IN DIPLOID CELLS. (E.) Long, W. K., Jr. (U. Illinois, Med. Ctr., Chicago) and N. Khoobyarian. *J Natl Cancer Inst* 51(5):1527-1533, 1973.

The fiber and hexon antigens of human adenovirus type 2 were purified by fluorocarbon extraction and chromatography on *O*-(diethylaminoethyl) cellulose. The antigens were characterized by polyacrylamide

gel electrophoresis before they were identified in complement fixation and hemagglutination tests. Purified fiber and hexon antigens were tested for several biologic activities in hamster embryo cells. Normal hamster embryo cells and hamster embryo cells transformed by simian adenovirus type 7(SA-7), and treated with either fiber or hexon antigen 20 hr before challenge with vaccinia, gave reduced yields of vaccinia virus after one cycle of virus replication. Fiber and hexon antigen treatment reduced the number of vaccinia infectious centers produced, which indicated a reduced number of productively infected cells. The effect of fiber and hexon antigen on cell macromolecular synthesis was determined by measuring their effect on the incorporation of ³H-labeled thymidine, uridine, and leucine into DNA, RNA, and protein, respectively. Both antigens reduced the incorporation of ³H-leucine into the protein of normal hamster embryo cells, whereas the fiber antigen had no effect on protein synthesis in SA-7-transformed hamster embryo cells. The effect of fiber and hexon antigen treatment on the transformation of hamster embryo cells by SA-7 was tested. Treatment with either fiber or hexon antigen reduced by 50% or more the number of transformed foci produced. Thus, treatment of primary hamster embryo cells with fiber and hexon antigens inhibits the replication of vaccinia virus.

- 6131 Q-BAND CHROMOSOME PATTERNS OF A VARIANT OF THE BHK 21 C13 CELL LINE. (E.) Marshall, R. (Inst. Virology, U. Glasgow, Scotland). *J Natl Cancer Inst* 51(5):1697-1700, 1973.

The chromosomes of a derivative of the Syrian hamster cell line BHK 21 C13, oncogenically transformed by polyoma virus and resistant to 8-azaadenine and 8-azaadenosine, were identified after staining with quinacrine dihydrochloride. The loss of 6 chromosomes from the parent population and the extensive rearrangements of the remaining 38 produced a homogeneous model population in which 22 single chromosomes and 4 pairs were differentiated by their Q-bands. The remaining 8 chromosomes not differentiated by their Q-bands fell into 2 groups, PyY/AA/AAR 13-17 and PyY/AA/AAR 27-29. Four single PyY/AA/AAR chromosomes (#10, 26, 30, and 34) and the 4 identifiable pairs of PyY/AA/AAR chromosomes (#19+20, 23+24, 32+33, and 37+38) had banding patterns similar to those of C13 chromosomes.

- 6132 ISOLATION OF DEFECTIVE MUTANT OF AVIAN SARCOMA VIRUS. (E.) Kawai, S. (Public Hlth. Res. Inst. City of New York, N.Y.) and H. Hanafusa. *Proc Natl Acad Sci USA* 70(12):3493-3497, 1973.

A colony of transformed cells was isolated from chick-embryo cells infected with a stock of non-defective Schmidt-Ruppin strain of Rous sarcoma virus. The virus recovered from this colony was a stable defective mutant very similar to the Bryan strain of Rous sarcoma virus in the following characteristics: noninfectiousness of virus particles released from transformed cells that lack helper factor; formation of infectious pseudotypes by co-

infection with avian leukosis virus or by interaction with endogenous-helper factor in chicken cells; ability of the noninfectious form of virus to transform chick-embryo cells in the presence of ultraviolet light-inactivated Sendai virus; absence of glycoprotein in the noninfectious form; failure to produce nondefective virus by recombination with avian leukosis virus; and segregation of polymerase-negative virus. The morphology of the transformed cells is characteristic of those infected by the Schmidt-Ruppin strain. The demonstration of segregation of such a defective virus from nondefective sarcoma virus and failure to detect revertants of this mutant suggest that the deletion of some genes may be involved in this mutation.

6133 PATHOGENESIS OF MAREK'S DISEASE IN CHICKS WITH AND WITHOUT MATERNAL ANTIBODY. (E.)

Payne, L. N. (Houghton Poultry Res. Station, Huntingdon, England) and M. Rennie. *J Natl Cancer Inst* 51(5):1559-1573, 1973.

The pathogenesis of Marek's disease (MD) in chicks with maternal antibody (AP) or without antibody (AN) was studied up to 35 days after infection. MD virus antigens, detected by fluorescent antibody tests, and lymphoid proliferation were more frequent in the tissues of AN chicks than in those of AP chicks. In the AN chicks, lymphoid proliferation was preceded by a phase of reticulum cell hyperplasia in the bursa, thymus, and spleen 5-7 days after infection; abundant viral antigen, cytolysis, intranuclear inclusion bodies, and infiltration by granulocytes, macrophages, and lymphocytes were also observed. This phase appeared to represent an inflammatory response to viral antigen and cellular degeneration, and was accompanied by lymphoid regression in the bursa and thymus. These changes were absent or markedly suppressed in AP chicks. The acute phase was followed by a recovery phase from 7-21 days after infection; in this phase, viral antigen disappeared from the lymphoid organs, lymphocyte populations in the bursa and thymus tended to return to normal, and areas of reticulum cell hyperplasia disappeared or were replaced by lymphoid tissue. Lymphoid proliferation leading to lymphoma formation and nerve infiltration commenced during the recovery phase. At the end of the experimental period, a second phase of viral antigen production occurred in the bursa and, less regularly, in the thymus and spleen; it was accompanied by lymphoid regression in the bursa and thymus.

6134 A LYMPHOBLASTOID CELL LINE DERIVED FROM CELLS OF MYELOID LEUKAEMIA BY INFECTION WITH EPSTEIN-BARR HERPES VIRUS. (E.) Lai, P. K. (State Hlth. Lab. Services, Perth, Western Australia), J. M. Papadimitriou, D. W. G. Kennett, W. M. Mackay-Scollay and M. P. Alpers. *Cytobios* 8(31):125-138, 1973.

A cell line (SH-RP) was established from the peripheral leucocytes of a patient with acute myeloid leukemia 10 days after *in vitro* infection with Epstein-Barr virus (EBV): no culture was established

without *in vitro* EBV infection. Cytochemical staining of these cells revealed that they were of myeloblastic origin, while immunofluorescence and electron microscopy revealed the presence of EB virus-capsid antigen, IgG antibody (no IgM antibody), and mature and immature herpes-like virus particles. Ultrastructurally, the SH-RP cells were lymphoblastoid in type, and they morphologically resembled the lymphoblastoid cells grown *in vitro* from patients with Burkitt's lymphoma or nasopharyngeal carcinoma. Several other normal, fetal, and neoplastic human cell types were infected with EBV. When compared with nonstimulated control cultures, all stimulated cultures from subjects who had antibodies against EBV, except one from a patient with Hodgkin's disease, showed varying degrees of blast formation. However, the percentage of viable cells in any one culture was generally low and most of the leucocytes gradually deteriorated 7 to 9 days after stimulation.

6135 METYRAPONE-INHIBITED ONCOGENESIS IN MICE INOCULATED WITH A MURINE SARCOMA VIRUS.

(E.) Rettura, G. (Albert Einstein Coll. Med., Bronx, N.Y.), J. Seifter, M. Zisblatt, S. M. Levenson, N. Levine and E. Seifter. *J Natl Cancer Inst* 51(6):1983-1985, 1973.

Male CBA/J mice were fed normal diets or diets containing 200 mg metyrapone/kg diet. Three days later, all animals were inoculated i.m. with varying concentrations of Moloney murine sarcoma virus (MSV). All control animals receiving the two highest concentrations of the inoculum developed palpable tumors; the tumor incidence was significantly lower in the metyrapone-treated mice. At the lowest viral concentration, metyrapone had no effect on tumor incidence. The latency period was affected inversely by the concentration of inoculum; metyrapone lengthened the latency period in only the group receiving the highest concentration. In a second experiment, all animals were fed normal diets and inoculated with varying concentrations of MSV; three days later, the experimental group was fed a diet containing metyrapone. The results were similar to those from the first experiment, although the metyrapone was more effective in increasing the latent period, decreasing the tumor size, and decreasing the time required for regression than in the first experiment. The action of metyrapone was probably nonspecific with respect to the virus, and its beneficial prophylactic action was probably due to a strengthening of the immune capabilities in the inoculated mice. This view is supported by the observation that metyrapone treatment caused thymic enlargement.

6136 LATENT INFECTION OF MONKEYS WITH ONCOGENIC HERPES VIRUSES. (E.) Laufs, R. (Hygiene-Inst., U. Gottingen, W. Germany) and L. V. Melendez. *Med Microbiol Immunol (Berl)* 158(4):299-308, 1973.

Two adult *Callithrix jacchus* monkeys were inoculated with a preparation of *Herpesvirus saimiri* (HVS) which had induced malignant lymphoma in four cotton topped (CT)-marmosets: neither of the *Callithrix*

jacchus monkeys developed malignant lymphoma. HVS was isolated by cocultivation of the monkeys' peripheral blood with owl monkey kidney cells; a CT-marmoset inoculated with virus thus recovered died of malignant lymphoma. Two other adult Callithrix jacchus monkeys were inoculated with tumor cells from a CT-marmoset with malignant lymphoma induced by *Herpesvirus ateles*; both monkeys carry the viral genome, which is still oncogenic, in their peripheral blood in latent form. Peripheral white blood cells from an adult owl monkey with latent HVS infection were transplanted into a CT-marmoset and a Callithrix jacchus monkey. The former died of malignant lymphoma, while the latter developed a latent infection with HVS. Peripheral lymphocytes from the latter animal produced fatal malignant lymphoma in a second owl monkey, while peripheral white blood cells from this monkey induced a latent infection with HVS in a second Callithrix jacchus monkey. Peripheral lymphocytes from an owl monkey and a Callithrix jacchus monkey with latent infections were able to synthesize infectious HVS particles in suspension cultures *in vitro*. The data indicate that the malignant lymphomas of monkey seem to require in their etiology some cofactor in addition to the herpesvirus; this cofactor is not species dependent.

- 6137 GRANULOCYTE MOBILIZATION BY ENDOTOXIN IN MICE AFTER INFECTION WITH RAUSCHER VIRUS. (Ger.) Seidel, H. J. (Dept. Clinical Physiol., U. Ulm, Germany) and E. Müller-Stöcker. *Blut* 27(6):407-415, 1973.

A study was made on the relation between peripheral neutropenia, bone marrow reserves of granulocytes and the mobilization of granulocytes into the peripheral blood in CBA/J mice after injection of Rauscher leukemia virus (0.2 ml i.p.). Bone marrow reserves of mature granulocytes were investigated with the leukocyte provocation test using endotoxin from *Salmonella abortus equi* (1 µg i.v.). It was found that the smallest endotoxin-induced granulocyte increase occurred simultaneously with the greatest virus-induced neutropenia in the peripheral blood and the greatest decrease in mature granulocytes in the bone marrow. The extent to which neutrophils increase in the peripheral blood is apparently a reliable criterion for bone marrow reserves.

- 6138 CHANGES IN MEMBRANE STRUCTURE ASSOCIATED WITH CELL CONTACT. (E.) Scott, R. E. (U. Minnesota Med. Ctr., Minneapolis), L. T. Furcht and J. H. Kersey. *Proc Natl Acad Sci USA* 70(12):3631-3635, 1973.

The ultrastructural analysis of 3T3 fibroblasts by freeze-cleavage has demonstrated significant changes in the cell-membrane structure associated with cell-to-cell contact and malignant transformation. These changes consist of a rearrangement and redistribution of intramembranous particles on the membrane fracture faces exposed by freeze-cleavage. The results show that noncontacted 3T3 cells in low density contain randomly distributed intramembranous par-

ticles. With the development of cell-to-cell contacts during the logarithmic phase of growth, however, a pronounced aggregation of intramembranous particles is seen. A direct correlation between the degree of cell contact and the percentage of cells showing intramembranous-particle aggregation has been established. By contrast, transformed SV3T3 and SP3T3 cells show no evidence of intramembranous-particle aggregation even at cell densities where cell-to-cell contact is extensive. In view of recent reports that intramembranous particles represent foci of interaction between certain intrinsic membrane proteins and lipids, it is proposed that the cell-to-cell contact of nontransformed 3T3 cells may initiate a change in the distribution of intrinsic membrane proteins associated with intramembranous particles and that these changes may influence the control of cell proliferation.

- 6139 *IN VITRO* INOCULATION OF RNA C-TYPE VIRUSES INDUCING REGRESSION OF EXPERIMENTAL SOLID TUMORS. (E.) Greenberger, J. S. (Natl. Cancer Inst., Bethesda, Md.) and S. A. Aaronson. *J Natl Cancer Inst* 51(5):1935-1938, 1973.

Kirsten murine sarcoma virus (KMSV)-transformed nonproducer lines of BALB/3T3 (K-BALB/3T3) and NIH/3T3 (K-NIH/3T3) and a transplantable tumor line produced in a BALB/c weanling by inoculation of BALB/3T12-3 cells were cultured. A clonal strain of Rauscher (R) mouse C-type virus was grown in NIH/3T3 cells and a BALB/c-tropic (B) mouse C-type virus was propagated in BALB/3T3 cells: pseudo-types of KMSV were thus obtained. Although cells infected with both the B and R helper viruses were somewhat immunogenic *in vivo*, the cells infected with R helper virus were more so. NIH Swiss and BALB/c weanling mice were inoculated s.c. with a 100% lethal dose of the appropriate syngeneic tumor cell line. When the tumors reached 1 cm in size, they were inoculated with either virus or virus-free medium. Among the animals treated with the virus medium, there was a 33 to 50% incidence of regression and resolution of tumors; the untreated animals and those treated with the virus-free medium developed progressive tumors and died within 8 wk. Similar results were obtained in animals receiving virus therapy at six months of age. The route of inoculation and number of injections had little or no effect on the results. The regressor animals observed for over eight months after treatment showed no evidence of tumor recurrence or any clinically evident side effects. The data indicate that the mechanism of tumor rejection involved an immunologic reaction against the virus-producing tumor cells.

- 6140 HOMOLOGY BETWEEN TYPE-C VIRUSES OF VARIOUS SPECIES AS DETERMINED BY MOLECULAR HYBRIDIZATION. (E.) Benveniste, R. E. (Natl. Cancer Inst., Bethesda, Md.) and G. J. Todaro. *Proc Natl Acad Sci USA* 70(12):3316-3320, 1973.

Two strains of feline leukemia virus, two endogenous feline type-C viruses (RD/CCC group), several endo-

genous and laboratory strains of murine "leukemia" virus, two rat viruses, two primate viruses (woolly monkey and gibbon ape), and hamster, pig, and avian type-C viruses were examined for their relatedness to one another by molecular hybridization. The extent of nucleic-acid homology was determined by hybridization of the various viral RNAs with a [^3H]DNA product synthesized from each virus. Among the murine type-C viruses (Rauscher, Kirsten, AT-124, and endogenous BALB/c virus) a high degree of homology is observed, although the viruses are not identical. The two primate viruses are also closely related to one another. The feline, rat, hamster, and pig endogenous viruses can be readily distinguished from one another and from the murine and primate viruses since their DNA products share very little or no nucleic-acid homology. However, the murine and primate type-C virus groups possess a surprising degree of relatedness. Feline type-C viruses fall into two distinct groups, the feline leukemia virus group and the RD-114/CCC group, with little detectable nucleic-acid homology between them. Infection of feline or rat cells with type-C virus results in production of the endogenous type-C virus of the species along with the infecting virus.

- 6141 THE 60 TO 70S RNA AND REVERSE TRANSCRIPTASE OF SIMIAN SARCOMA AND SIMIAN SARCOMA-ASSOCIATED VIRUSES. (E.) Jensik, S. (Rush-Presbyterian-St. Luke's Med. Ctr., Chicago, Ill.), J. Hoekstra, S. Silver, R. L. Northrop and F. Deinhardt. *Intervirology* 1(4):229-241, 1973.

Normal marmoset skin cultures (HF) were established and infected with either feline sarcoma virus (FeSV) or simian sarcoma virus type 1 and its associated, nontransforming virus (SSV-1/SSAV-1). Purified SSV-1/SSAV-1 had a density of 1.135, and the nucleic acid extracted from it generally consisted of a heavy 60 to 70S RNA and a significant amount of light, 4S RNA; occasionally, several other species of RNA were detected which possessed S values ranging between 15 and 35. There was no obvious correlation between the base ratio of SSV-1/SSAV-1 RNA and those of other RNA tumor viruses, although the base ratio of the simian virus RNA differed from that of avian and mammalian ribosomal RNAs. The native viral 60-70S RNA of SSV-1/SSAV-1 served as a template for DNA synthesis; hybridization experiments confirmed that the DNA polymerase was synthesizing DNA molecules from the 70S RNA. Endogenous enzyme activity required magnesium and was inhibited by ribonuclease. However, in contrast to other C-type viruses, the omission of DTT resulted in at least a 2-fold increase in enzymatic activity.

- 6142 RIBONUCLEIC ACID COMPONENTS OF MURINE SARCOMA AND LEUKEMIA VIRUSES. (E.) Maisel, J. (Dept. Molecular Biol., U. California, Berkeley), V. Klement, M. M.-C. Lai, W. Ostertag and P. Duesberg. *Proc Natl Acad Sci USA* 70(12):3536-3540, 1973.

Defective Kirsten murine sarcoma virus was present as leukemia virus pseudotype [Ki-MSV(MLV)] in a 10-

to 100-fold excess over its helper, Kirsten murine leukemia virus (Ki-MLV), when the two viruses were propagated in an NRK rat cell line. The $s_{20,20}$ of the fast-sedimenting RNA complex of Ki-MLV and of Ki-MSV(MLV) was 62S and 55S, resp. Gel electrophoresis in buffered aqueous or formamide solution of the dissociated 62S RNA complex of Ki-MLV showed a single major peak of molecular wt about 2.5×10^6 . The dissociated 55S RNA of Ki-MSV(MLV) was resolved into a major component with a higher electrophoretic mobility than that of Ki-MLV RNA and molecular wt about 2.3×10^6 . Occasionally, a minor component with the same electrophoretic mobility as Ki-MLV RNA was observed in Ki-MSV(MLV) RNA; it is thought to be the RNA of Ki-MLV present as helper virus in the stocks of Ki-MSV(MLV). The RNA of an endogenous rat C-type RNA virus was electrophoretically different from both Ki-MLV RNA and Ki-MSV(MLV) RNAs. Oligonucleotide fingerprinting of the RNAs digested with RNase T1 indicated that the RNAs of Ki-MSV(MLV) and Ki-MLV are different although this method did not reveal the extent of the difference. The heat-dissociated 50-70S RNAs of two other defective murine sarcoma-leukemia viruses, Harvey-MSV(MLV) and Moloney-MSV(MLV), and of defective spleen-focus-forming Friend virus were resolved electrophoretically into two components. The larger components had the same electrophoretic mobility as the RNA of Ki-MLV or Moloney MLV. The smaller were not present in the leukemia virus. It is suggested that the small RNA components of the two murine sarcoma viruses and of Friend virus represent specific genetic information of these replication-defective transforming viruses.

- 6143 TEMPERATURE-DEPENDENT FORMATION OF DIMERS AND OLIGOMERS OF MITOCHONDRIAL DNA IN CELLS TRANSFORMED BY A THERMOSENSITIVE MUTANT OF ROUS SARCOMA VIRUS. (E.) Nass, M. M. K. (Sch. Med., U. Pennsylvania, Philadelphia). *Proc Natl Acad Sci USA* 70(12):3739-3743, 1973.

In chick-embryo fibroblasts infected by T5, a temperature-sensitive mutant of Schmidt-Ruppin Rous sarcoma virus, the level of catenated dimeric and oligomeric mitochondrial DNA is temperature-dependent and correlates with the phenotypic manifestation of transformation. At the permissive temperature (36 C), where transformation is expressed, the elevated (2- to 3-fold) oligomeric level characteristic of cells transformed by the wild-type Rous sarcoma virus was observed, but at the nonpermissive temperature (41 C), at which cells appear normal and behave normally, the oligomer level was characteristic of uninfected cells. Temperature shifts from 41 to 36 C and vice versa resulted in phenotypic reversion and reversals of the respective levels of multiple-length DNA. Cellular growth rates were not altered. Treatment of control cells with cycloheximide resulted in a 5-fold increase in oligomeric DNA, whereas exposure to 9- β -D-arabinofuranosyladenine had little effect. With both inhibitors, nuclear but not mitochondrial DNA synthesis was inhibited. A conformational and/or functional alteration in the mitochondrial membrane of a malignant cell might affect the attachment site of mtDNA and DNA

replication. It is also possible that a protein factor or enzyme(s) involved in the replication of mtDNA is manufactured in the cytoplasm and then transferred into the organelles. The inhibition of cytoplasmic protein synthesis by cycloheximide might then lead to a deficiency of such enzyme(s).

- 6144 DOES BREAST-FEEDING INCREASE THE CHILD'S RISK OF BREAST CANCER? (E.) Miller, R. W. (Nat'l. Cancer Inst., Bethesda, Md.) and J. F. Fraumeni, Jr. *Pediatrics* 49(5):645-646, 1972.

Although studies of human milk suggest a viral etiology of human breast cancer, epidemiological observations run counter to the hypothesis that the oncogenic agent is transmitted through the mother's milk. In the United States breast cancer rates have risen as breast feeding declined, and rates for the neoplasm are low among the socioeconomic groups which have favored nursing at the breast. Also, in many countries where breast-feeding is common, rates for breast cancer are low. Breast cancer occurs among mothers and sisters of affected women at a rate two or three times greater than that expected by chance. A genetic basis for this observation is supported by the fact that familial aggregation of breast cancer occurs equally in female antecedents on both sides of the family, not just the maternal side. Finally, in the single study that has been made of mother-daughter occurrence of breast cancer in regard to infant feeding, no relationship to breast-feeding was found.

- 6145 A CONTINUOUS IN VITRO SOURCE OF HERPES-VIRUS SAIMIRI. (E.) Oie, H. K. (Nat'l. Cancer Inst., Bethesda, Md.), D. V. Ablashi, G. R. Armstrong, G. R. Pearson, T. Orr and U. Heine. *J Nat'l Cancer Inst* 51(3):1077-1080, 1973.

Infection of a spontaneously transformed rhesus monkey-embryo cell line (MEST) by *Herpesvirus saimiri* (HVS) resulted in a persistently infected cell culture. The growth medium and temperature of incubation could be manipulated to favor either virus replication or cell growth. The HVS-MEST system can be kept with or without routine passaging for many months and could probably be maintained in a virus-productive state for as long as desired. The HVS-MEST system can be used as a convenient source of infectious virus and viral antigen.

- 6146 ANALYSIS OF IMMUNOELECTRON MICROSCOPY OF TYPE-C VIRUSES ASSOCIATED WITH PRIMARY AND SHORT-TERM TRANSPLANTED MOUSE PLASMA CELL TUMORS. (E.) Aoki, T. (Nat'l. Cancer Inst., Bethesda, Md.), M. Potter and M. M. Sturm. *J Nat'l Cancer Inst* 51(5):1609-1617, 1973.

Immunoelectron microscopy was used to analyze the antigenic properties of type-C viruses and the appearance of differentiation antigen PC1 in primary and/or short-term transplanted mineral oil-induced myelomas of four mouse strains (BALB/c; two recom-

binant strains, C X BG and C X BJ; and C57BL/6). In PC⁺ strain BALB/c mice, primary myelomas whose cells carried PC1 antigen produced many type-C viruses. These viruses were classified into three populations: murine myeloma-associated viruses (MuMAV) carrying a type-specific virus envelope antigen xVEA distinct from known typical murine leukemia virus (MuLV); MuLV (Gross); and other yet uncharacterized type-C viruses. In PC⁻ strains, where normal plasma cells carried no PC1 antigen, myeloma cells from some mice became PC⁺ and released complete type-C viruses, either xVEA⁺MuMAV alone or all three populations. However, some mice developed PC⁻ myelomas accompanied by no viruses or only uncharacterized viruses. These results led to two possible conclusions: that PC1 antigen was perhaps induced by xVEA⁺MuMAV; or that xVEA⁺MuMAV and/or the uncharacterized type-C viruses may have had an important role in the development of some myelomas. The finding of PC1 antigen on macrophages provided new information regarding the tissue distribution of this antigen.

- 6147 CHARACTERISTICS OF INFECTION BY RSV. II. DEPENDENCE ON CELL EVENTS WHICH CAN OCCUR IN THE G2 PHASE AND AFTER MITOSIS. (E.) Golde, A. (Curie Fdn. Radium Inst., Orsay, France), J. Villaudy and J. Aghion. *Intervirology* 1:250-258, 1973.

Chick embryo fibroblasts synchronized in two different ways were infected at various times in the cell cycle with partially purified Bryan strain of Rous sarcoma virus phenotypically mixed with RAV1 (B-RSV(RAV1)) in the presence of a particular calf serum. In all experiments, with both methods of synchronization, the length of the latent period depended on what point in the cell cycle the cells were infected. In cultures infected in the G1 and S phases, the production of the virus was delayed until phase G2 or after the cell division, depending on what method was used to synchronize the cells. In cultures infected after the G2 phase, the production of the virus was delayed until after cell division. It is concluded that cell event(s) are required at some stage of the infection for it to be successful; they can occur in a synchronous manner in the G2 phase, before replication of the mitochondrial DNA, and after the wave of mitoses when some component(s) are present in the calf serum used to induce the cell division.

- 6148 EXPRESSION OF A- AND C-TYPE PARTICLES IN EARLY MOUSE EMBRYOS. (E.) Chase, D. G. (VA Hosp., Sepulveda, Calif.) and L. Piko. *J Nat'l Cancer Inst* 51(6):1971-1975, 1973.

Electron microscopy of early mouse embryos from the 1-cell stage to the blastocyst revealed two types of intracisternal A particles, a C-type particle budding into the extracellular space, and an endoplasmic reticulum-associated "dense-cored vesicle." The morphology of these particles is described. The occurrence and frequency of the particles showed a marked dependence on the developmental stage of the embryo. The observations of this study provide evidence for the general occurrence of A- and C-type

viral genomes in mouse cells and their transmission through the germ cells. Whether viral genetic expression has any functional significance for embryo development is unclear.

6149 ORAL EXCRETION OF *HERPESVIRUS SAIMIRI* IN CAPTIVE SQUIRREL MONKEYS AND INCIDENCE OF INFECTION IN FERAL SQUIRREL MONKEYS. (E.)

Falk, L. A. (Rush-Presbyterian-St. Luke's Med. Ctr., Chicago, Ill.), S. Nigida, F. Deinhardt, R. W. Cooper and J. I. Hernandez-Camacho. *J Natl Cancer Inst* 51(6):1987-1989, 1973.

The incidence of latent *Herpesvirus saimiri* (HVS) infections among recently imported squirrel monkeys that had been in captivity for about 20 days were determined as was the presence of any HVS in oropharyngeal secretions of captive monkeys carrying the virus. HVS was isolated from peripheral lymphocytes of 16 of 20 squirrel monkeys (*Saimiri sciureus*) recently imported from the region of Leticia, Amazonas, Colombia. Sera of all 20 animals (including juveniles as young as 1-1/2 yr of age) had antibodies to HVS. A group of ten female squirrel monkeys, captive for more than one yr and also shown to be HVS carriers, were examined over five months for oral excretion of HVS. Virus was consistently isolated from oropharyngeal secretions of nine monkeys. Filtration studies showed that at least some HVS present in the oropharyngeal secretions was cell free. The origin of HVS present in oral secretions of squirrel monkeys is not known. Regardless of the type of oropharyngeal tissues from which virus is released, the repeated isolation of HVS from serially collected specimens indicates that clinically healthy squirrel monkeys excrete HVS consistently or intermittently over long periods.

6150 INTERACTIONS OF EARLY MOUSE EMBRYOS WITH ONCOGENIC VIRUSES — SIMIAN VIRUS 40 AND POLYOMA. I. ULTRASTRUCTURAL STUDIES. (E.) Biczysko, W. (Wistar Inst. Anatomy Biol., Phila., Pa.), D. Solter, M. Pienkowski and H. Koprowski. *J Natl Cancer Inst* 51(6):1945-1954, 1973.

Two-celled mouse embryos, blastocysts, and egg-cylinders were exposed to simian virus 40 (SV40) and polyoma virus. Uptake of SV40 but not of polyoma was found when two-celled embryos were exposed to virus. Blastocysts and egg-cylinders exposed to SV40 or polyoma showed adsorption and uptake of virus particles. When infected blastocysts were grown *in vitro* for 96 hr, replication of virus in the nuclei of endodermal cells and uptake of newly synthesized virus by neighboring cells were found. Infected egg-cylinders grew *in vitro* and showed signs of organogenesis after 96 hr. Replication of SV40 and polyoma was observed in endodermal cells, yolk sac cells, and cells of blood islands. Uptake of newly synthesized viruses was found in the cells of the neural tube. Although mouse somatic cells are permissive for replication of polyoma but non-permissive for replication of SV40, this difference was not observed in early embryos which were permissive for both viruses. It may be surmised that

the mechanism by which mouse somatic cells inhibit formation of infectious SV40 is not operative in the cells of mouse embryos during the early stages of development. Thus permissiveness or nonpermissiveness for SV40 infection cannot be related to a given species of animal, but rather to a factor(s) which becomes operative in the late stages of embryogenesis and persists during the lifetime of an animal.

6151 HERPES SIMPLEX VIRUS LATENCY IN SV40 HAMSTER TUMOUR CELLS. (E.) Boldogh, I. (U.

Med. Sch., Debrecen, Hungary), L. Geder and L. Vaczi. *Acta Microbiol Acad Sci Hung* 20:127-134, 1973.

The incubation of SV40 tumor cell cultures with herpes simplex virus type 2 (HSV-2) at 40 C resulted in rapidly growing cells which survived the infection and lacked both virus cytopathology and synthesis of detectable infectious virus. Following transfer to 37 C, infectious HSV-2 reappeared and persistent cell infection developed without complete destruction of the cell line. There was, however, a delay of at least 8 to 22 days following the transfer to 37 C before infectious virus could be detected. HSV-specific immunofluorescent antigens were present in every cell in latency. The reappearance of infectious HSV-2 paralleled focal cytopathogenic changes. The period between the disappearance and reappearance of infectious virus is considered the latent period. Cultures in this period were less sensitive to superinfection with herpes simplex virus type-2 than control cultures. The reappearance of infectious HSV-2 after prolonged incubation of infected culture at 40 C and 37 C indicates that HSV-2 can remain associated with the cells in a non-infectious form for a prolonged period without being degraded.

6152 ALTERED GROWTH BEHAVIOR OF MALIGNANT CELLS ASSOCIATED WITH CHANGES IN EXTERNALLY LABELED GLYCOPROTEIN AND GLYCOLIPID. (E.) Gahmberg, C. G. (Sch. Med., U. Washington, Seattle) and S.-I. Hakomori. *Proc Natl Acad Sci USA* 70(12):3329-3333, 1973.

Using galactose oxidase (EC 1.1.3.9) followed by reduction with tritiated sodium borohydride, the surface structures of polyoma virus transformed 3T3 and NIL cells, under ordinary growth conditions, were characterized by deletion of the normally existing glycoprotein label and the appearance or increase of a new glycoprotein label. The NIL cells had a galactoprotein label with molecular wt 200,000 that was deleted in NIL cells transformed by polyoma virus. The 3T3 cells had a glycoprotein label with molecular wt of 30,000 that was lost after transformation. The glycoproteins of the transformed 3T3 cells, with molecular wt 105,000, and those of the transformed NIL cells, with molecular wt 85,000, were not labeled in normal confluent cells, but became labeled after trypsin treatment. The label in the glycolipids was quantitatively different in the normal and transformed cells. The labeling pattern in the glycoprotein and glycolipids of the transformed NIL and 3T3 cells became similar to that

of the nontransformed cells when the contact responses of transformed cells became conspicuous upon culturing of the cells in the presence of dextran sulfate or dibutyl cyclic adenosine monophosphate, or in medium in which glucose was replaced with galactose.

- 6153 *IN VIVO AND IN VITRO STUDIES ON THE MORPHOGENESIS OF TUMORS INDUCED BY MURINE SARCOMA VIRUS (HARVEY).* (E.) Thomas, W. R. (Tobacco Res. Council Labs., Yorkshire, England), E. J. Aw, J. M. Papadimitriou and P. J. Simons. *J Natl Cancer Inst* 51(5):1541-1549, 1973.

Primary angiosarcomas resulting from the inoculation of a Harvey murine sarcoma virus (MSV-H) preparation into the thigh muscles of mice were minced and plated in collagen-coated plastic petri dishes. These cultures eventually produced several different mesenchymal cell types which produced rapidly growing tumors (fibrosarcomas, undifferentiated sarcomas, angiosarcomas) when inoculated into newborn mice. However, the frequency of tumor growth from these cells was low in adults and the regression rate was high. Of the four cell lines established, only one readily grew on conventional tissue culture surfaces. The tumors induced by the inoculation of cells from three of the cell lines were histologically distinct from the virus-induced lesion. Although the tumors growing from the fourth line histologically resembled the type of tumor induced by the original virus, it was more cellular, contained fewer inflammatory cells, and grew at the same rate as the other tumors. The data indicate that the degree of differentiation of a tumor cell is influenced by environmental factors both *in vivo* and *in vitro*, which results in the production of different mesenchymal derivatives.

- 6154 *GENETIC STUDIES ON HERPES SIMPLEX VIRUS. II. RECOMBINATION BETWEEN DIFFERENT STRAINS OF HERPES VIRUS TYPE 1.* (E.) Yamamoto, S. (Kurume U. Sch. Med., Japan), H. Kabuta and T. Miyamoto. *Kurume Med J* 20(3):149-157, 1973.

Serially passaged cells derived from rabbit kidney (RK cells) were infected with YH and M strain herpes simplex viruses differing in sensitivity to 5-iodo-2'-deoxyuridine (IDU) and plaque forming ability. The progeny of these virus combinations were tested for plaquing on African green monkey kidney (GMK) cells and for IDU sensitivity. The antigenicities of the progeny from a cross between the YH and Z strains were tested by simple neutralization using anti-Z serum. Recombination frequencies of 14.1 and 15.2 were obtained for the YH X M crosses. With regard to the YH X Z crosses, the recombination frequency was approximately 50% between plaque morphology and antigenicity. A 42% frequency was obtained between antigenicity and IDU resistance. The YH X Z crosses also produced some clones which appeared to be intermediate between the parent viruses. All but two of the recombinant clones retained their characters even after seven passages in RK cells. Two recombinant clones possessing intermediate antigenic

character did change after passage through the RK cells. The antigenicity of these two clones changed to that of one of the parents, and one of the clones yielded a virus with a different plaque morphology.

- 6155 *DEVELOPMENT OF CELL LINES AFTER EXPOSURE OF CHICKEN EMBRYONIC FIBROBLASTS TO HERPES SIMPLEX VIRUS TYPE 2 AT SUPRAOPTIMAL TEMPERATURE.* (E.) Geder, L. (U. Med. Sch., Debrecen, Hungary), L. Vaczi and I. Boldogh. *Acta Microbiol Acad Sci Hung* 20:119-125, 1973.

Chicken embryonic fibroblasts were exposed to Herpes simplex virus type 1 (HSV-1) and type 2 (HSV-2). Incubation at 40 C for prolonged periods inhibited the production of infectious HSV-2 without preventing most of the cells from degeneration. This procedure, however, resulted in the rapid growth of a few cells which survived infection and showed no cytopathic changes or synthesis of infectious virus. Two isolated clones grew into continuous cell lines; both showed increased resistance to HSV-2 infection, but proved to be susceptible to HSV-1. HSV-specific antigens were found in 5-10% of the cells using the indirect immunofluorescent technique. These chicken cell lines afforded an opportunity to study the effect of HSV-2 on cells under non-permissive conditions.

- 6156 *SURFACE MODIFICATIONS IN BHK21 CELLS DETECTED WITH CONCAVALIN A DURING ABORTIVE TRANSFORMATION INDUCED BY POLYOMA VIRUS.* (Fr.) de Micco, Ph. (I.N.S.E.R.M. Res. Unit, Marseille, France), Y. Barra and G. Meyer. *Ann Microbiol (Inst Pasteur)* 124B(2):239-251, 1973.

Agglutination with concanavalin A was used to demonstrate that a temporary change occurred on the surface of BHK21 hamster fibroblasts following abortive infection with the Toronto small plaque strain of polyoma virus. For agglutination determinations a constant number of cells ($0.75 \times 10^6/0.5$ ml) was mixed with a constant quantity of concanavalin A (100 μ g/0.5 ml), and the extent of agglutination was scored on a five-point numerical scale. A curve was obtained by plotting the extent of agglutination against the time elapsed after addition of concanavalin A to the cell suspension. A coefficient α was calculated which represented the reactivity of the cells toward concanavalin A. The value of α was determined at various times after infection of BHK21 cells with polyoma virus in medium containing either 10% or 0.2% calf serum. In medium containing the higher concentration of calf serum, a diphasic curve was obtained with a maximum at 36 hr and a second maximum 52 hr after infection. In medium containing 0.2% serum a single maximum was obtained 52 hr after infection. By using a cell population which had been roughly synchronized by addition of medium with a high concentration of serum following culture in a medium with a low serum concentration, the effect of the mitotic cycle on agglutination was investigated. The curve obtained for agglutination of these synchronized cells was flat and remained slightly above the limits for nonsignificant biological variations.

- 6157 CHANGE IN MARROW AND SPLEEN CFU COMPARTMENTS FOLLOWING LEUKEMIA VIRUS INFECTION: COMPARISON OF FRIEND AND RAUSCHER VIRUS. (E.) OKunewick, J. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.) and E. L. Phillips. *Blood* 42(6):885-892, 1973.

The effects of the Friend and Rauscher leukemia viruses on the marrow and spleen colony-forming unit (CFU) compartments of SJL/J female mice were studied. Within 14 days after infection with either virus, the CFU compartment in the spleen was grossly enlarged. In the marrow of the Friend-infected mice, the CFU number did not differ significantly from normal values, while in the Rauscher-infected mice, there was a 50% drop in the marrow CFU. Measurement of the F factor indicated that infection by either virus resulted in colony-forming units that were deficient in comparison with normal CFU in their ability to successfully "seed" in the spleens of irradiated normal recipients; the cells obtained from the spleen tissue showed a greater F factor depression. Thus, with both viruses the nature of the host tissue exerts a significant modifying effect on the expression of the viral action. The data also suggest that the pluripotent colony-forming unit may be a target cell for the Friend and Rauscher viruses.

- 6158 COMPARISON OF THREE MAMMARY TUMOR VIRUSES IN GENETICALLY SIMILAR SUSCEPTIBLE MICE. (E.) Vlahakis, G. (Natl. Cancer Inst., Bethesda, Md.). *J Natl Cancer Inst* 51(5):1711-1712, 1973.

Three naturally-occurring milk-borne mammary tumor viruses (MTVs) from the following inbred mouse strains were compared in genetically similar virgin and breeder BALB/cHe hosts which did not have MTV: C3H/He, A/He, and DD/He. In the absence of the hormones of pregnancy, the C3H-MTV was still effective in producing mammary tumors in susceptible BALB/c females; however, the tumors developed later and less frequently in the virgin hosts than in the breeders. Compared with BALB/cfC3H and BALB/cfCC breeders, mammary tumors in the BALB/cfA breeders were slightly reduced, but the difference between the BALB/cfDD and BALB/cfA breeders was not significant. The average age of tumor development was increased in the BALB/cfA mice, but only slightly compared with the BALB/cfDD animals. A-MTV was a weaker or less effective virus than C3H-MTV in producing mammary tumors in virgin females. Compared with both the C3H and A-MTVs, the MTV of DD is the weakest or least effective virus in the production of mammary tumors in virgin BALB/c females. Thus, the three MTVs differ in their oncogenic ability.

- 6159 POLYOMA VIRUS DOSE-RESPONSE STUDIES IN RATS. I. RELATIONSHIP BETWEEN ONCOGENICITY AND ANTIGENICITY. (Ger.) Desselberger, U. (Inst. Virol. Infect. Diseases, Med. Coll., Hannover, Germany), A. Georgii, H. Ostertag and H. Zobl. *Zentralbl Bakteriол (Orig A)* 225(2/3):197-210, 1973.

Newborn Wistar rats were injected s.c. or i.p. with polyoma virus (S.E. strain) from which nonspecific

inhibitors had been removed by treatment of cell detritus from mouse embryonic fibroblast cultures with receptor destroying enzyme. The rats were sacrificed 40 days later, and the titer of hemagglutination-inhibition (HI) antiviral antibodies was determined in their whole blood and their kidneys were examined for the presence of sarcomas. Multiple regression analysis showed that when antigenicity was held constant, tumorigenicity increased significantly with increasing infectivity, expressed in log median tissue culture infective dose (TCID₅₀) units. However, when tumorigenicity was held constant, infectivity had no significant effect on antigenicity; and when infectivity was held constant, tumorigenicity and antigenicity were not significantly correlated. When antigenicity was calculated separately for animals with and without tumors, a relatively higher HI titer was found for rats with tumors. By comparing antibody response to inhibitor-free native and formaldehyde-inactivated viruses, it was estimated that infective virus multiplied only ten to 100-fold *in vivo*. Emulsification of virus suspensions with incomplete Freund's adjuvant significantly increased the immune response and reduced tumorigenicity to 0% when water-in-oil emulsions were injected s.c. into newborn rats. Adsorption of viral preparations on δ -Al₂O₃ also significantly increased the immune response but had no appreciable effect on tumorigenicity. Repeated administration of small doses of native virus also increased antibody production, and when injections were administered s.c. at ages 1, 10 and 20 days, only two of the 21 rats in this group developed tumors.

- 6160 DETECTION OF A SUBSTANCE WITH ANTIVIRAL ACTION IN THE CULTURE MEDIUM OF NZB MOUSE CELLS. (Fr.) Levy, J. A. (Cancer Res. Inst., U. California, San Francisco), J.-C. Chermann, C. Jasmin and M. Raynaud. *C R Acad Sci (Paris)* 277(14):1421-1423, 1973.

A biological inhibitor (NZB-I) associated with New Zealand Black (NZB) mouse cells was isolated. NZB-I inhibited focus formation by murine leukemia virus (MLV) in normal rat kidney cells at a concentration of 250 μ g/ml and in embryonic mouse cells at a concentration of 25 μ g/ml. When present in a concentration of 250 μ g/ml, NZB-I also inhibited focus formation by murine sarcoma virus (MSV) in human cell cultures. At concentrations of 25 μ g/ml or higher, NZB-I inhibited XC plaque formation by MLV (Rauscher strain); 2.5 μ g/ml of NZB-I still inhibited plaque formation by 65%. At a concentration of 125 μ g/ml, NZB-I inhibited focus formation by Rous sarcoma virus in chick embryonic fibroblasts. The inhibitor acted after penetration of virus particles into the cells. Inhibition persisted for more than one hr after incubation at 56 C. NZB-I was not inactivated by treatment with an alcohol-ether-chloroform mixture (1:1:1) nor by decreasing the pH to 2.0 for 18 hr. Inhibition was not caused by ribonuclease or deoxyribonuclease in the NZB-I nor by the extraction procedure. It may be that the difficulty in cultivating the NZB virus is caused by NZB-I which might prevent maturation of C virus in NZB cells.

- 6161 SPECIFICITY OF THE DNA PRODUCT OF RNA-DEPENDENT DNA POLYMERASE IN TYPE C VIRUSES: II. QUANTITATIVE ANALYSIS. (E.) Okabe, H. (Flow Labs., Inc., Rockville, Md.), R. V. Gilden and M. Hatanaka. *Proc Natl Acad Sci USA* 70(12, Part II): 3923-3927, 1973.

A number of mammalian Type C viruses were analyzed for relatedness via DNA-RNA hybridization. Viral DNAs were prepared in single-stranded form from complexes with 70S viral RNA formed during endogenous polymerase reactions. The extent of hybridization was determined with the single-strand nuclease (S-1) from *Aspergillus oryzae*. The results indicated a high degree of viral specificity, with significant cross-reactions being observed only with viruses obtained from within a species, as in the case of mouse and cat viruses, or in the special case of woolly monkey-gibbon comparisons. Comparisons of RD-114 virus, recently determined to be of feline origin, and conventional feline Type C viruses (FeLV), revealed minimal relatedness, especially when feline virus was grown on human cells; this indicated the possible coexistence of greatly disparate Type C viruses within one species. A rat-specific virus, recovered from tumors induced by murine sarcoma virus, was found to contain genetic material common to both the original mouse virus and viruses indigenous to the rat, even though only rat-specific proteins have been detected during infection by this virus.

- 6162 TUMOR-VIRUS RELATIONSHIPS IN GROSS VIRUS-INDUCED MOUSE LYMPHOMAS. (E.) Vredevoe, D. L. (Ctr. Health Sci., U. California, Los Angeles) and E. F. Hays. *J Natl Cancer Inst* 51(5):1619-1626, 1973.

Virus-induced (C3H), virus-accelerated (AKR), spontaneous (AKR), and cell-passaged (AKR and C3H) Gross lymphomas were compared in AKR/J and C3H/HeJ mice with regard to: latent periods of lymphoma post isolation of a cell source for syngeneic cell passage; minimum lethal doses of cells transplanted to syngeneic recipients; and murine leukemia virus measured by a tissue-culture XC-cell assay and a newborn virulence assay. Lymphoma latent periods were decreased when the initial isolation from a virus-induced source was compared to latent periods of the third cell passage in C3H mice ($P = 0.001$) but not in AKR mice ($P = 0.07$). Many generations later, the latent periods of lymphoma remained longer in C3H than AKR transplanted lymphomas. Minimum lethal doses of lymphoma cells did not appear to be related to the source of the transplanted cells. In both AKR and C3H mice, the LD 80-100 (the minimum dose of cells tested resulting in fatal lymphoma in 80-100% of recipients) generally tended to decrease as generations post isolation increased. Virus expression was apparently not related to success of cell transplantation. The XC-cell assay was uniformly positive for all AKR lymphoma lines. It was positive for only a few virus-induced C3H lines and single-cell transplanted lines derived from them. The newborn assay was positive for AKR virus-accelerated lymphomas but

weakly positive or negative for long-transplanted or spontaneous AKR lymphomas. It was positive for all C3H virus-induced lines but weakly positive or negative for long-transplanted lines. The lack of correlation between the XC-cell and newborn assays suggests that, in the AKR system, two populations of virions exist: one capable of *in vitro* plaque formation and the other capable of oncogenicity *in vivo*.

- 6163 UNIQUE NUCLEAR DNA SEQUENCES IN THE INVOLVED TISSUES OF HODGKIN'S AND BURKITT'S LYMPHOMAS. (E.) Kufe, D. W. (Coll. Physicians and Surgeons, Columbia U., New York, N.Y.), W. P. Peters and S. Spiegelman. *Proc Natl Acad Sci USA* 70(12):3810-3814, 1973.

(^3H)DNA probes were synthesized from four Burkitt's lymphomas, three Hodgkin's disease specimens, and one lymphosarcoma. In all instances, the lymphoma (^3H)DNA probe hybridized 35 to 40% to normal spleen nuclear DNA. The sequences shared with normal nuclear DNA were removed by exhaustive annealing of the (^3H)DNA with normal spleen DNA in vast excess; the unpaired (^3H)DNA was recovered by hydroxyapatite chromatography. The unpaired residue did not enter complexes with normal DNA but did form well-paired duplexes with the nuclear DNA of the neoplastic tissue from which the particles were derived. In addition, the unpaired residues derived from Burkitt's and Hodgkin's tumors cross hybridized with each other's nuclear DNA, suggesting that particle-related information found in these two lymphomas share sequences in common. Cells carrying multiple copies of the DNA of Epstein-Barr virus did not complex with the (^3H)DNA synthesized by either Hodgkin's or Burkitt's particles, indicating that these sequences have no relation to the DNA of Epstein-Barr virus.

- 6164 DIFFERENCE BETWEEN ENZYME ACTIVITIES IN LYMPHOBLASTOID CELL LINES OF DIFFERENT ORIGINS: NASOPHARYNGEAL CANCER (NPC), BURKITT'S LYMPHOMA (BL), INFECTIOUS MONONUCLEOSIS AND NORMAL DONORS. (Fr.) Buissiere, J. (Army Health Service Res. Ctr., Lyon, France), P. Nardon, C. Desgranges, M.-L. Didier-Fichet and G. de-The. *C R Acad Sci (Paris)* 277(14):1417-1420, 1973.

A microtechnique developed for determining enzyme activities in bacteria was used to determine the activities of 18 enzymes in cultures of lymphoblasts from nasopharyngeal carcinoma (NPC), Burkitt's lymphoma (BL), infectious mononucleosis, and peripheral blood cells from two normal subjects. Virions of Epstein-Barr virus (EBV) were detected in all cell lines except those from normal donors. Cell lines from patients with mononucleosis and normal donors all contained β -glucosaminidase, β -glucuronidase and β -glucosidase activities. NPC cell lines had little or no β -glucosidase activity, while BL cell lines had no detectable β -glucosaminidase or β -glucosidase activity. Alkaline phosphatase activity was highest in cell lines of normal origin followed by BL and then NPC cell lines. No β -galactosidase was detected in any of the cell lines studied, but

this enzyme was observed in other lines infected with pleuro-pneumonia-like organisms. These findings suggest that lymphoblast cells from BL differ from all the other cell lines. BL cell lines may be direct descendants of lymphoma cells, while the other lines may be descendants of lymphoid cells infected with EBV whose oncogenic capacity is manifested only *in vitro*. Differences in enzymes which metabolize glycoproteins suggest that surface antigens are different in these cell lines.

- 6165 A MORE SENSITIVE ASSAY SYSTEM FOR THE DETECTION OF RNA-DEPENDENT DNA POLYMERASE IN ONCOGENIC RNA VIRUSES. (E.) De Clercq, E. (Rega Inst. Med. Res., U. Leuven, Belgium) and P. J. Claes. *Biochim Biophys Acta* 331(3):328-332, 1973.

A standard RNA-dependent DNA polymerase assay mixture containing the Moloney strain of murine leukemia virus and either saline or carbopol 934 was incubated and assayed at various intervals for acid-precipitable radioactivity. The addition of carbopol to the mixture resulted in a significant increase in the rate and extent of DNA synthesis whether the carbopol was included in the reaction mixture from the beginning or added at various times after the beginning of incubation. The stimulatory effect of carbopol on the RNA-dependent DNA polymerase activity was dose-dependent, the maximum response being obtained with a carbopol concentration of 160 µg/ml. Varying concentrations of Triton X-100 in the assay mixture did not affect the effect of carbopol on the DNA synthesis.

- 6166 *IN VITRO* HOST RANGE AND SEROLOGIC STUDIES ON RD-114 VIRUS. (E.) Rasheed, S. (U. Southern California Sch. Med., Los Angeles), R. M. McAllister, B. E. Henderson and M. B. Gardner. *J Natl Cancer Inst* 51(4):1383-1384, 1973.

RD-114 is a C type virus recovered from a human rhabdomyosarcoma cell line after transplantation in a fetal cat; it has been shown that RD-114 belongs to a new class of endogenous feline type-C viruses. Seventy-six of 81 (94%) human cell cultures were productively infected with RD-114 virus. None of 8 cat-embryo cell cultures susceptible to FeLV were infected with RD-114. Syncytia were induced in two human cell cultures, but no morphologic transformation was observed in any infected human or animal cultures for 2-3 months. Specific complement-fixing antibodies to RD-114 gs or envelope antigen were not detected in human or cat cancer or control sera.

- 6167 ISOLATION OF ONCORNAVIRUSES FROM CONTINUOUS HUMAN CELL CULTURES. (E.) Zhdanov, V. M. (D. I. Ivanovsky Inst. Virology, Moscow, USSR), V. D. Soloviev, T. A. Bektemirov, K. V. Ilyin, A. F. Bykovsky, N. P. Mazurenko, I. S. Irin and F. I. Yershov. *Intervirology* 1(1):19-26, 1973.

Sixteen human cell cultures of hemopoietic, cancer cell, sarcoma cell, spontaneously-transformed renal embryo cell, and amniotic cell origin were labeled

with ³H-uridine and grown with and without actinomycin D. Six of the cultures spontaneously released virions of B or C type; these virions were not released in cultures treated with actinomycin D. Upon treatment with 5-bromodeoxyuridine or mitomycin C, five additional cultures released oncornaviruses. The virions banded at a density of 1.16 to 1.18 g/ml in sucrose gradients, contained 60 to 70S RNA, and possessed reverse transcriptase activity. The cultures were negative for murine gs antigens.

- 6168 IMMUNOCHEMICAL DETECTION OF TUMOR-SPECIFIC AND EMBRYONIC ANTIGENS OF DIETHYLNITROSAMINE-INDUCED GUINEA PIG TUMORS. (E.) Borsos, T. (Natl. Cancer Inst., Bethesda, Md.), A. K. Richardson, S. H. Ohanian and E. J. Leonard. *J Natl Cancer Inst* 51(6):1955-1960, 1973.

Xenogeneic antibodies against diethylnitrosamine-induced transplantable guinea pig hepatoma cells (line-1 and line-10) were obtained by immunization of rabbits with live cells. By appropriate absorption of antisera, antibody against tumor-specific antigen was obtained. The specificity of the absorbed antisera was shown in three different tests: C1 fixation and transfer, fluorescent antibody, and complement-dependent cytotoxicity. Analysis of absorption results with normal adult guinea pig tissues and guinea pig embryo showed that in addition to line-specific tumor antigens, line-1 and line-10 tumor cells have an embryonic antigen in common. Using specific antibody, it was found that the minimum number of line-10-specific tumor antigen sites/cell was about 100,000. The xenogeneic antisera were also used in an antibody absorption test for measurement of soluble tumor-specific antigen.

- 6169 INHIBITION BY INTERFERON OF POLYOMA VIRUS-INDUCED CELL DNA SYNTHESIS IN MOUSE PERITONEAL MACROPHAGES. (E.) Mallucci, L. (Guy's Hosp., London, England) and J. Taylor-Papadimitriou. *J Gen Virol* 21:391-398, 1973.

- 6170 GLYCOLYTIC ENZYME ACTIVITY OF CELLS INFECTED WITH ADENOVIRUS TYPES 5 AND 12. (E.) Bardell, D. (Dept. Microbiol., U. New Hampshire, Durham). *Microbios* 8(29):53-61, 1973.

- 6171 WART VIRUSES AND LARYNGEAL PAPILLOMAS. (E.) Cook, T. A. (Baylor Coll. Med., Houston, Tex.), A. M. Cohn, J. P. Brunschwig, J. S. Butel and W. E. Rawls. *Lancet* (7806):782, 1973.

- 6172 CHARACTERIZATION OF TEMPERATURE-SENSITIVE MUTANTS OF SV40. (E.) Ishikawa, A. (Natl. Inst. Hlth. Tokyo, Japan) and T. Aizawa. *J Gen Virol* 21:227-237, 1973.

- 6173 DENSE BODIES IN DUCK EMBRYO CELLS INFECTED WITH TURKEY HERPES. (E.) Nii, S. (Res. Inst. Microbial. Dis., Osaka U., Japan), I. Katsume and K. Ono. *Biken J* 16(3):111-116, 1973.
- 6174 RHESUS LEUKOCYTE-ASSOCIATED HERPESVIRUS. II. NATURAL AND EXPERIMENTAL INFECTION. (E.) Bissell, J. A. (FDA, Div. Virol., Rockville, Md.), A. L. Frank, N. R. Dunnick, D. S. Rowe, M. A. Conliffe, P. D. Parkman and H. M. Meyer, Jr. *J Infect Dis* 128(5):630-637, 1973.
- 6175 RHESUS LEUKOCYTE-ASSOCIATED HERPESVIRUS. I. ISOLATED AND CHARACTERIZATION OF A NEW HERPESVIRUS RECOVERED FROM RHESUS MONKEY LEUKOCYTES. (E.) Frank, A. L. (FDA, Div. Virol., Rockville, Md.), J. A. Bissell, D. S. Rowe, N. R. Dunnick, R. E. Mayner, H. E. Hopps, P. D. Parkman, and H. M. Meyer, Jr. *J Infect Dis* 128(5):618-629, 1973.
- 6176 MOLECULAR WEIGHT OF DENATURED RAUSCHER VIRUS RNA DETERMINED BY SEDIMENTATION IN FORMALDEHYDE. (E.) Bases, R. (Albert Einstein Coll. Med., Bronx, N.Y.) and F. Mendez. *Biomedicine* 19(10):421-425, 1973.
- 6177 DNA-BINDING PROTEINS SPECIFIC FOR CELLS INFECTED BY ADENOVIRUS. (E.) Van Der Vliet, P. C. (Dept. Biochemical Sci., Princeton U., N.J.) and A. J. Levine. *Nature [New Biol]* 246(154):170-174, 1973.
- 6178 ENHANCEMENT OF UPTAKE OF SIMIAN VIRUS 40 BY NUCLEI OF PERMISSIVE CELLS. (E.) Tan, K. B. (Wistar Inst. Anatomy Biol., Philadelphia, Pa.) and F. Sokol. *Proc Soc Exp Biol Med* 144(3):802-807, 1973.
- 6179 CHARACTERISTICS OF STRAINS OF ACUTE FORMS OF MAREK'S DISEASE. (Rus.) Korovin, R. N. (All-Union Sci. Res. Inst. Fowl Dis., USSR), V. A. Lokh, F. S. Kusriavtsev, A. S. Sungurova, E. A. Sedunov and B. I. Dozorov. *Veterinariia* (11):47-49, 1973.
- 6180 BURKITT'S LYMPHOMA IN AN ISRAELI CHILD. (E.) Freundlich, E. (Government Hosp., Nahariya, Israel), H. Suprun, L. Braunstein, B. Stamler, J. Yaron and J. Levy. *Isr J Med Sci* 9(8):1052-1054, 1973.
- 6181 FEATURES OF THE INTRACELLULAR STRUCTURE IN CELLS OF HUMAN ORIGIN WHICH PRODUCE ONCORNAVIRUS TYPE B. (Rus.) Bukrinskaia, A. G. (D. I. Ivanovskii Inst. Virol., Moscow, USSR), G. G. Miller, E. N. Lebedeva and V. M. Zhdanov. *Dokl Akad Nauk SSSR* 213(6):1421-1423, 1973.
- 6182 TIME OF IMPLANTATION OF MAREK DISEASE VIRUS IN YOUNG CHICKENS. (E.) Torn, B. (Phylaxia Vet. Biol. Feedstuffs Inst., Budapest, Hungary) and S. Masztis. *Acta Microbiol Acad Sci Hung* 20(1):38, 1973.
- 6183 PATHOGENICITY OF A MAREK DISEASE HERPES VIRUS STRAIN DURING SERIAL PASSAGES IN DUCK EMBRYO FIBROBLAST CULTURES. (E.) Bamberger, K. (Vet. Res. Inst., Hungarian Acad. Sci., Budapest) and C. Dren. *Acta Microbiol Acad Sci Hung* 20(1):50-51, 1973.
- 6184 GROWTH IN SIZE OF ADENOVIRUS 31 DEOXYRIBONUCLEIC ACID. (E.) Suzuki, E. (Inst. Med. Sci., U. Tokyo, Japan) and H. Shimojo. *Jap J Microbiol* 17(5):429-430, 1973.
- 6185 ALTERED RESPONSIVENESS TO ERYTHROPOIETIN IN MICE FOLLOWING INFECTION WITH POLYCYTHEMIA-INDUCING FRIEND VIRUS. (E.) McGarry, M. P. (Roswell Park Mem. Inst., Buffalo, N.Y.) and E. A. Mirand. *Exp Hematol* 1(3):174-182, 1973.
- 6186 INHIBITION OF ADENOVIRUS MULTIPLICATION BY METABOLIC INHIBITORS. (E.) Wigand, R. (Inst. Hyg. U. Saarlandes, Hamburg, Germany) and J. Schmieder. *Arch Gesamte Virusforsch* 42(4):324-338, 1972.
- 6187 VIRION POLYPEPTIDES AND STRUCTURE OF SV 40. (E.) Ho, L. (U. Coll. Hosp., London, England) and A. Cohen. *Arch Gesamte Virusforsch* 42(4):317-323, 1973.
- 6188 POLYPEPTIDES OF MAMMALIAN ONCORNAVIRUSES. I. ISOLATION AND SEROLOGICAL ANALYSIS OF POLYPEPTIDES FROM MURINE AND FELINE C-TYPE VIRUSES. (E.) Green, R. W. (Duke U. Med. Ctr., Durham, N.C.), D. P. Bolognesi, W. Schäfer, L. Pister, G. Hunsmann and F. De Noronha. *Virology* 56(2):565-579, 1973.
- 6189 REPLICATION OF THE PARVOVIRUS MVM. II. ISOLATION AND CHARACTERIZATION OF INTERMEDIATES IN THE REPLICATION OF THE VIRAL DEOXYRIBONUCLEIC ACID. (E.) Tattersall, P. (Imp. Cancer Res. Fund, London, England), L. V. Crawford and A. J. Shatkin. *J Virol* 12(6):1146-1156, 1973.
- 6190 CLEAVAGE OF CIRCULAR, SUPERHELICAL SIMIAN VIRUS 40 DNA TO A LINEAR DUPLEX BY S₁ NUCLEASE. (E.) Beard, P. (Stanford U. Med. Ctr., California), J. F. Morrow and P. Berg. *J Virol* 12(6):1303-1313, 1973.
- 6191 THE PROTEINS OF POLYOMA VIRUS. (E.) Consigli, R. A. (Dept. Biol. Med., U. Geneva, Switzerland), J. Zabielski and R. Weil. *Experientia* 29(6):770, 1973.

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6192 REPLICATION OF A TYPE I AVIAN ADENOVIRUS (CELO) MUTANT IN THE CHICKEN EMBRYO. (E.) Miller, L. T. (Animal Path., U. Rhode Island, Kingston), D. E. Fry and V. J. Yates. *Arch Gesamte Virusforsch* 43(1-2):88-97, 1973.

6193 ULTRASTRUCTURE OF HERPES SIMPLEX VIRUS INFECTION OF THE NERVOUS SYSTEM OF MICE. (E.) Yamamoto, T. (Sch. Med., U. Tokyo, Japan), S. Otani and H. Shiraki. *Acta Neuropathol* 25(4):285-299, 1973.

6194 T-LYMPHOCYTE PROLIFERATION IN MONONUCLEOSIS. (E.) Virolainen, M. (Dept. Path., U. Helsinki, Finland), L. C. Andersson, M. Lalla and R. Von Essen. *Clin Immunol Immunopathol* 2(1):114-120, 1973.

6195 THE ETIOLOGY OF BREAST TUMORS. (Sp.) Moraza Ortega, M. (Dept. Surg., Salamanca U., Spain). *Medicamenta* 61(511):383-388, 1973.

6196 UTILIZATION OF THE PAROTITIS VIRUS FOR OVERCOMING GENETIC RESISTANCE OF CELLS AGAINST ROUS VIRUS. (Rus.) Kuznetsov, O. K. (N.N. Petrov Res. Inst. Oncol., Leningrad, USSR), A. I. Zhudina and A. M. Dyadjkova. *Vopr Onkol* 19(11):28-36, 1973.

6197 INFECTION, HAEMORRHAGE AND DEATH OF CHICK EMBRYOS AFTER INOCULATION OF HERPES SIMPLEX VIRUS TYPE 2 ON THE CHORIOALLANTOIC MEMBRANE. (E.) Rodgers, F. G. (Central Public Hlth. Lab., London, England). *J Gen Virol* 21(1):187-191, 1973.

6198 GERMAN CENTER FOR CANCER RESEARCH, HEIDELBERG. (Ger.) Wagner, G. (German Ctr. Cancer Res., Heidelberg) and T. Wieland. *Naturwissenschaften* 60(12):539-547, 1973.

See also:

- * (Rev): 6014, 6024, 6026, 6027
- * (Chem): 6032, 6043, 6060, 6069
- * (Phys): 6115
- * (Immun): 6199, 6204, 6209, 6211, 6217, 6227, 6230, 6244
- * (Epid-Biom): 6276

- 6199 THE INFLUENCE OF IMMUNOSUPPRESSION AND ALLOGRAFTING ON VIRUS-INDUCED LYMPHATIC LEUKEMIA IN MICE. (E.) Reid, R. H. (U. Oregon Med. Sch., Portland), B. Pirofsky and P. J. Dawson. *Transplantation* 13(2):61-65, 1972.

Six-week-old BALB/c mice were inoculated with lymphatic leukemia virus after which they were given 0.25 ml antilymphocyte antiserum (ALS) i.p. twice weekly for 8 weeks, 2 mg/kg azathioprine i.p. daily for 8 weeks, a combination of ALS and azathioprine for the same period of time, 0.25 ml normal horse serum (NHS) i.p. daily, or no further treatment. Control groups were given the same treatments with no prior virus inoculation. Among another group of virus-inoculated animals, the following groups were established: virus alone, tail-skin graft from C57BL/6J mice, ALS, ALS plus skin graft, azathioprine, and azathioprine plus skin graft. Control groups were given the same treatment with no prior virus inoculation. In the first experiment, the ALS and azathioprine produced increased mortality and shortened the latent period to the same degree in the virus-inoculated mice; there was a synergistic effect when the two were combined. There was also a 100% mortality rate due to spontaneous leukemia among the noninoculated animals receiving ALS plus azathioprine; this may represent the activation of a latent virus in BALB/c mice. NHS in the inoculated mice increased the latent period. Application of an allogeneic skin graft also prolonged the latent period of viral leukemogenesis; the potentiating effect of azathioprine was abolished in the grafted animals, as was the development of spontaneous leukemia in normal mice receiving ALS plus azathioprine. The allogeneic skin graft may serve as a reticulo-endothelial stimulant as well as provide a large additional dose of antigen(s). Thus, in human patients receiving organ transplants under ALS therapy, the graft might tend to counteract any possible action of the ALS in unmasking latent oncogenic viruses.

- 6200 RECRUITMENT OF EFFECTOR T LYMPHOCYTES AGAINST A TUMOR ALLOGRAFT BY T LYMPHOCYTES SENSITIZED *IN VITRO*. (E.) Treves, A. J. (Weizmann Inst. Sci., Rehovot, Israel) and I. R. Cohen. *J Natl Cancer Inst* 51(6):1919-1925, 1973.

To study tumor allograft rejection mediated by lymphoid cells, a system was developed in which lymphocytes were sensitized *in vitro* and their anti-tumor activity was tested *in vivo*. Normal thymus lymphocytes were sensitized *in vitro* against allogeneic fibroblasts, then were separated from the sensitizing fibroblasts and injected into the footpads of syngeneic mice. The popliteal lymph node enlarged and developed effector cells that specifically rejected a tumor allograft. This resistance appeared to result from *in vitro* sensitization of the donor lymphocytes, since injection of alloantigens could not induce resistance in the recipient mice. Using irradiation of either the sensitized donor lymphocytes or the recipient mice, it was found that the effector cells were not the clonal descendants of the sensitized lymphocytes but were recruited by them within the recipient mouse lymph

nodes. Mice that were thymectomized, irradiated, and reconstituted with bone marrow were used to study the origin of the participating lymphocytes; it was found that both recruiter and recruited lymphocytes were thymus-dependent T cells. Thus it appeared that interaction between two populations of T cells occurred during the tumor allograft response.

- 6201 INDUCTION OF CELL-MEDIATED IMMUNITY AGAINST LEUKEMIA EL4 IN C57BL MICE. (E.) Kemp, A. (Duke U. Med. Ctr., Durham, N.C.), G. Berke, J. Crowell and B. Amos. *J Natl Cancer Inst* 51(6):1877-1882, 1973.

The s.c. growth of leukemia EL4 in C57BL mice was suppressed when the tumor cells were mixed with immune BALB/c anti-EL4 peritoneal exudate lymphoid cells before injection into C57BL mice. The protected mice showed increased resistance to a subsequent s.c. or i.p. challenge with EL4 tumor cells alone. Effector cells of C57BL origin and cytotoxic for EL4 tumor cells *in vitro* were detected in the peritoneal cell exudate and also prevented s.c. EL4 tumor growth in C57BL mice. These experiments demonstrated a means for the induction of cellular immunity against a lethal tumor in susceptible hosts.

- 6202 HISTOLOGICAL AND IMMUNOLOGICAL OBSERVATIONS ON COMMON WARTS IN REGRESSION. (E.) Brodersen, I. (Dept. Dermatol., Finsen Inst., Copenhagen, Denmark) and J. Gerner. *Acta Derm Venereol (Stockh)* 53(6):461-464, 1973.

Twenty-six common warts showing clinical signs of regression (darkness or dark spots) were studied histologically as well as for complement-fixing antibodies in serum. The control group comprised 27 warts without signs of regression. No evidence of lymphocyte infiltration was found in either group. Complement-fixing antibodies to wart virus were found in three patients with warts in regression and in two of the controls. Thus, the study did not support the hypothesis according to which cellular immunity or serum antibodies to wart virus should be responsible for the spontaneous cure of warts.

- 6203 QUANTITATIVE LUNG COLONY ASSAY FOR TUMOR IMMUNITY IN MICE. (E.) Boone, C. W. (Natl. Cancer Inst., Bethesda, Md.), E. Lundberg, T. Orme and R. Gillette. *J Natl Cancer Inst* 51(5):1731-1734, 1973.

A lung colony assay for measuring tumor immunity in mice is described. This assay is a useful alternative to the conventional method of counting the number of tumor "takes" after s.c. challenge with graded doses of tumor cells. Mice to be tested were challenged with tumor cells i.v. Two wk later, the lungs were removed, and each lobe was separately fixed and embedded in flattened form (<1 mm thick). Sections were made at one-third and two-thirds the distance through the flattened lobes and stained with hematox-

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ylin and eosin. The tumor cell colonies could then be easily seen and counted microscopically. Cells from a transplantable squamous cell carcinoma, a breast adenocarcinoma, and a fibrosarcoma were tested. The mean coefficient of variation of the colony count in the 2 sections through the flattened lobes was 12.8%. The lung-colonizing efficiency of the 3 tumor lines was 167-208 colonies/ 10^6 cells injected. The use of lung colony counts to assay tumor immunity was demonstrated with a transplantable simian virus 40-transformed fibrosarcoma and a tissue culture-transformed BALB/3T3 fibrosarcoma.

6204 EFFECT OF ANTIBODY TO θ ANTIGEN ON CELL-MEDIATED IMMUNITY INDUCED IN SYNGENEIC MICE BY MURINE SARCOMA VIRUS. (E.) Herberman, R. B. (Nat'l. Cancer Inst., Bethesda, Md.), M. E. Nunn, D. H. Lavrin and R. Asofsky. *J Natl Cancer Inst* 51(5):1509-1512, 1973.

C57BL/6N mice were immunized with Moloney murine sarcoma virus and their lymphocytes tested for cytotoxic reactivity in a 51 chromium release assay. The positive reactions obtained 14 to 70 days after immunization were strongly inhibited by pretreatment of the lymphocytes with anti- θ antibody and complement. An antiglobulin reagent, which had previously been shown to inhibit lymphocyte-dependent antibody cytotoxicity, had no effect. These data indicate that the θ -positive lymphocytes were responsible for most of the immune reactivity. In contrast, normal lymphocytes had low levels of cytotoxic reactivity which was not eliminated by anti- θ .

6205 TUMOR-SPECIFIC, CELL-MEDIATED IMMUNITY IN GUINEA PIGS WITH TUMORS. (E.) Littman, B. H. (Nat'l. Cancer Inst., Bethesda, Md.), M. S. Meltzer, R. P. Cleveland, B. Zbar and H. J. Rapp. *J Natl Cancer Inst* 51(5):1627-1635, 1973.

Cell-mediated immunity (CMI) to tumor-specific antigen in male Sewall Wright guinea pigs with transplantable syngeneic tumors was measured by macrophage migration inhibition (MIF) assay, lymphocyte transformation, and delayed cutaneous hypersensitivity (DCH) reaction. A 3M KCl tumor cell extract and mitomycin-C-treated tumor cells were sources of tumor antigen for these tests; the data indicated that the 3M KCl extracts contain the surface antigens represented on the mitomycin-C-treated tumor cells. Specific CMI to tumor antigen was detected in animals with tumors as well as in animals immunized to the tumor. The response of the immune guinea pigs in lymphocyte transformation was 2 to 3 times greater than that of the tumor-bearing animals. The results of MIF tests with peritoneal exudate (PE) cells from immunized guinea pigs indicated 70 to 75% inhibition of migration as compared with 40% inhibition when the PE cells were obtained from tumor-bearing animals. These differences in responsiveness to tumor antigens may reflect differences in the absolute number of lymphocytes capable of tumor antigen recognition. Tumor immunity was augmented and appeared earlier in animals that were immunized with a mixture of tumor cells and BCG com-

pared with animals that were immunized with tumor cells alone or with animals that received BCG and tumor cells at separate sites as measured by the MIF assay. The DCH test was the least sensitive test in animals with tumors.

6206 GLIA-SPECIFIC ANTIGENS IN CELL CULTURES FROM RABBIT BRAIN, HUMAN FOETAL AND ADULT BRAIN, AND GLIOMAS. (E.) Wahlström, T. (III Dept. Path., U. Helsinki, Finland), W. Linder and E. Saksela. *Acta Pathol Microbiol Scand (B)* 81(6):768-774, 1973.

Immune sera were obtained from rabbits showing severe signs of encephalomyelitis following the injection of a lyophilized homogenate of normal human brain tissue. In double diffusion tests, these sera left precipitin lines against normal human brain tissue, human glioblastoma, and rabbit brain tissue. Cultures of human fetal brain and baby rabbit brain were established; the former consisted of two morphologically distinct glia-like cells and nonglial cells, while the latter consisted primarily of nonglial cells with some glia-like cells. The oligodendroglia of the human fetal brain cultures exhibited a strong fluorescence following absorption with the rabbit immune sera; a less intense fluorescence was seen in the astroglial cells. When the cultures were propagated through 10 or more passages *in vitro*, the oligodendroglial cells disappeared and the only cells with positive immunofluorescent staining were the astroglial cells. In human adult brain cell cultures, the astroglial cells had a perinuclear fluorescence that was considerably weaker than in the fetal cells. Occasional bipolar spongioblast-like cells on top of the astroglia showed the most intense staining. The glia-like cells in the baby rabbit brain cultures stained to reveal a fibrillary network similar to that seen in the human astroglial cells; the nonglial cells in these cultures did not stain. Cultures of skin fibroblasts and cells from two sarcoma lines were not stained by the immune sera, and the preimmunization rabbit sera did not stain any cells. Absorption of the sera with 100 mg of lyophilized normal human brain removed all the fluorescence.

6207 CROSSED IMMUNOELECTROPHORETIC CHARACTERIZATION OF HERPESVIRUS HOMINIS TYPE 1 AND 2 ANTIGENS. (E.) Vestergaard, B. F. (Inst. Med. Microbiol., Copenhagen, Denmark). *Acta Pathol Microbiol Scand (B)* 81(6):808-810, 1973.

Herpesvirus hominis (HVH) type 1 and 2 antigens were analyzed using the crossed immunoelectrophoretic method. Three major antigens, identified by their relative migration velocities, were common to both HVH type 1 and type 2. One of these antigens had different migration velocities in the HVH type 1 and 2 preparations, but it showed antigenic identity in tandem electrophoresis. Two additional fast-moving antigens were found only in the HVH type 2 preparation. Precipitating antibodies towards bovine albumin were found in both preparations; the presence of these antibodies was due to the fact that the

HVH-infected rabbit cells used for immunization had been grown with 10% bovine serum prior to virus inoculation.

- 6208 ANTIBODIES AGAINST METHYLCHOLANTHRENE SARCOMA CELLS IN THE BLOOD OF INTACT MICE. (E.) Fedorovskaya, M. I. (Inst. Problems in Oncology, Acad. Sci., Ukrainian SSR, Kiev, USSR), E. P. Vetrova and Yu. A. Umanski. *Bull Exp Biol Med* 76(7):819-821, 1973.

Methylcholanthrene was injected into BALB/c and C57BL mice, after which their sera were tested using cytotoxic and membrane-fluorescence methodologies. Blood sera taken from the mice prior to treatment contained no antibodies against autologous or isologous tumor cells. However, antibodies against autologous and isologous tumor cells released from methylcholanthrene-induced sarcomas in the treated mice were detected. In an autologous system, the antibody level against tumor cells in the BALB/c mice was lower than in an isologous system in the same animals and than an autologous system in the C57BL mice. In the C57BL mice, the levels of these antibodies in the autologous and isologous systems were the same.

- 6209 IN VITRO CYTOTOXICITY STUDIES OF MURINE SARCOMA VIRUS-INDUCED IMMUNITY IN MICE. (E.) Lavrin, D. H. (Litton Bionetics, Inc., Kensington, Md.), R. B. Herberman, M. Nunn and N. Soares. *J Natl Cancer Inst* 51(5):1497-1508, 1973.

The kinetics of cell-mediated and humoral immune responses to murine sarcoma virus were studied by ⁵¹chromium-release cytotoxicity assays. Adult C57BL/6N, (BALB/c X C57BL/6)F₁, and BALB/cN mice were inoculated with 4 different stocks of Moloney murine sarcoma virus, and immune reactivity was measured at various times after immunization by cytotoxic reaction against the Rauscher virus-induced lymphoma, RBL-5. In general, cellular reactivity reached a maximum approximately 14 days after virus administration; humoral antibody titers did not reach their maximum levels until after 30-40 days. Considerable differences between the strains of mice and between the virus stocks were observed in terms of tumor growth patterns and immune reactivity. There was some correlation between experimental groups in the lack of progressive tumor growth and the degree of immune reactivity. However, immune reactivity in individual mice could not clearly be related to the tumor growth pattern.

- 6210 EFFECT OF IMMUNIZATION ON THE SPREAD OF TRANSPLANTED MOUSE LYMPHOMA CELLS. (E.) Klein, E. (Dept. Tumor Biol., Karolinska Inst. Stockholm, Sweden). *J Natl Cancer Inst* 51(5):1991-1992, 1973.

C57/L and (ABY X DBA/2)F₁ mice were immunized with YHA cells (a Moloney virus-induced lymphoma of C3H origin) which had been irradiated *in vitro*. At

various times thereafter, the mice received 400 R total-body irradiation and were challenged s.c. with syngeneic Moloney lymphoma cells (YLD or YDYA). Both the YLD and YDYA cells induced the growth of generalized lymphomas with lymph node enlargement in nonimmune animals, while, in fully immunized animals, no tumor growth occurred. If, however, the animals were challenged when immunity was not fully developed, tumors grew but remained localized at the site of inoculation in a number of animals. The levels of circulating antibodies increased as a function of the time since immunization. No immunoglobulins were detected by immunofluorescence on the cells harvested from the immune animals.

- 6211 ASSIGNMENT OF THE T-ANTIGEN GENE OF SIMIAN VIRUS 40 TO HUMAN CHROMOSOME C-7. (E.) Croce, C. M. (Wistar Inst. Anat. Biol., Philadelphia, Pa.), A. J. Girardi and H. Koprowski. *Proc Natl Acad Sci USA* 70(12):3617-3620, 1973.

Hybrid cell clones derived from mouse cells deficient in thymidine kinase (EC 2.7.1.21) and two different human cell lines transformed by simian virus 40 (SV40) and deficient in hypoxanthine phosphoribosyltransferase (EC 2.4.2.8) were examined for SV40 tumor (T) antigen(s). Concordant segregation of the gene(s) for SV40 T antigen and human chromosome C-7, was observed in these hybrids. The human chromosome C-7, which contains the gene(s) for SV40 T antigen, is preferentially retained by the majority of the hybrid clones tested. When hybrid clones positive and negative for SV40 T antigen, derived from the fusion of SV40-transformed Lesch-Nyhan fibroblasts with mouse cells, were fused with CV-1 permissive cells, SV40-specific V antigen was observed only in the cultures derived from fusion of the hybrid clones positive for T antigen. This result indicates a linkage relationship between the human chromosome C-7, the SV40 T-antigen gene(s), and the SV40 genome(s) integrated in the human transformed cells.

- 6212 SOME ASPECTS OF THE DISTURBANCES OF THE HUMORAL AND CELLULAR IMMUNOLOGICAL BARRIER IN LEUKEMIA PATIENTS. (Pol.) Szmigiel, Z. (Med. Acad. Krakow, Poland). *Przegląd Lekarski* 30(6):514-517, 1973.

Disturbances of immunological competence in different types of leukemia which affect prognosis and treatment are reviewed. It is stressed that 1) the ability to produce antibodies against bacteria and viruses in patients with chronic lymphocytic leukemia is reduced; 2) the levels of IgG, IgA and IgM are markedly lower in these patients even before therapy is begun; 3) the levels of complement are reduced in acute leukemia and production of interferon by lymphocytes decreased in acute and chronic leukemia; 4) the percentage of immunologically incompetent lymphocytes is markedly increased in chronic lymphocytic leukemia while transformation capability of lymphocytes in acute and chronic granulocytic leukemia is either normal or increased before treatment, but markedly reduced after therapy; 5) skin reaction to tuberculin and dinitrochlorobenzene is reduced in chronic lympho-

cytic leukemia; 6) the phagocytic capability of RES cells is reduced in acute leukemia and the phagocytic and migration capability of granulocytes reduced in chronic granulocytic leukemia. The immunologic competence decreases with duration of disease and is aggravated by treatment with immunosuppressive drugs. It is essential to test for immunological competence before and during therapy. The tests should include determination of phagocytic activity of leukocytes, transformation capability of lymphocytes, levels of IgG, IgA, IgM, complement properdin and interferon and skin reaction to TB and DNCB.

- 6213 THE INFLUENCE OF HOST SPLENECTOMY ON THE TUMOUR ALLOGRAFT-PROMOTING EFFECTIVENESS OF ANTILYMPHOCYTE SERUM. (E.) Nouza, K. (Inst. Exp. Biol. Genetics, Czechoslovak Acad. Sci., Praha), M. Nemec and P. Draber. *Folia Biologia Acad Sci Bohemoslovaca* 19(4):267-272, 1973.

Male B10.LP mice were splenectomized and 3 wk later inoculated with methylcholanthrene-induced sarcoma I (SaI) cells; half of the animals were subsequently treated with antilymphocyte serum (ALS). In the splenectomized animals, the tumors grew more slowly and reached a smaller size and the incidence of secondary growth was greatly reduced, as was the mortality rate. In a second experiment, male C57BL/6 mice were splenectomized 1, 2, 3, or 4 wk prior to SaI inoculation. When performed 1 wk before tumor inoculation, splenectomy did not counteract the effect of ALS on tumor growth. When performed 2, 3, or 4 wk prior to tumor inoculation, splenectomy more or less strongly counteracted the effect of ALS. In the splenectomized animals, the tumor growth reached its first peak somewhat earlier, the onset of secondary growth was retarded, and the tumors were reduced in size. The incidence of complete regression of the tumor allografts increased as a function of the interval between splenectomy and inoculation. The mortality rate among mice splenectomized 3 wk prior to tumor inoculation was much lower than among the nonsplenectomized animals; the mortality rates among the animals splenectomized 1, 2, or 4 wk prior to tumor inoculation resembled those in the nonsplenectomized mice.

- 6214 IMMUNOLOGIC STUDIES IN LYMPHOMA AND LEUKEMIA, AND EXPLORATION OF ANTITUMOR IMMUNOTHERAPY. (E.) Sokal, J. E. (Roswell Park Mem. Inst., Buffalo, N.Y.). *J Surg Oncol* 5(6):557-567, 1973.

Prospective studies, conducted over a period of years, have demonstrated that survival with malignant lymphoma or chronic leukemia correlates with the status of the patients' cellular immune reactivity. Most of the clinical trials so far initiated have focused on the general stimulation of cellular immune reactivity rather than specific antitumor immunization; the agent most commonly employed has been BCG, and there has been some clinical experience with Corynebacterium. Intradermal vaccination with BCG-cell mixtures has been found to produce: general stimulation of the cellular immune responses; specific

delayed hypersensitivity against target cell antigens, demonstrable both *in vivo* and *in vitro*; and minimal stimulation of antibody production. The vaccination schedules so far explored have had no significant effects on the survival of patients whose neoplastic disease was not under control. However, patients whose disease was in complete remission at the time of immunotherapy may have benefited significantly from stimulation of their cellular immune mechanisms. Encouraging, though inconclusive, results have been obtained in patients with Hodgkin's disease and patients with osteogenic sarcoma. Unequivocal results were obtained with a group of poor-risk and better-risk patients with chronic myelocytic leukemia; the survival times of the immunized patients were significantly increased over those of nonimmunized controls.

- 6215 THE CHEMICAL NATURE OF CANCER BASIC PROTEIN. (E.) Dickinson, J. P. (Newcastle Gen. Hosp., England) and E. A. Caspary. *Br J Cancer* 28(Suppl. 1):224-228, 1973.

Experimental evidence is put forward supporting the notion of a cell sensitizing antigen present in all malignant tumors and its restriction to malignant tissue pointed out. In addition to this common tumor specific antigen an antigen is described that is apparently present in all tissues but is distinguished from tumor antigen on the basis of its relative activity as determined by macrophage migration inhibition testing. Both of these antigens are shown to be, like the encephalitogen of brain, basic proteins of molecular wt 16-18,000 daltons, having proteolipid properties, present on the external surface of the plasma membrane and carrying the cell sensitizing property in a small fragment of the whole protein.

- 6216 DETECTION OF VARIOUS ANTIGENIC DETERMINANTS OF THE INTERSPECIES TYPE IN MAMMALIAN RNA (C-TYPE) VIRUSES. (Ger.) Schäfer, W. (Max Planck Inst. Virus Res., Tübingen, Germany), G. Hunsmann, V. Moennig, R. Wollmann, L. Pister, F. Deinhardt and J. Hoekstra. *Z Naturforsch [C]* 28(3/4):214-222, 1973.

Group-specific antigens in RNA viruses from a variety of mammalian species were investigated by the Ouchterlony precipitation reaction with immune sera from Rauscher and Friend mouse leukemia viruses, Moloney sarcoma virus, and feline leukemia virus. On the basis of these reactions, the viruses have been classified into two groups. In the first group, which includes murine leukemia and cat leukemia and sarcoma viruses, two group-specific antigenic determinants were found. In the second group, which includes swine virus and simian sarcoma virus (type 1) from the woolly monkey, only the second of these group-specific antigenic determinants was present. RD₁₁₄ virus, which was isolated from human rhabdomyosarcoma cells by passage in cat embryonic fibroblasts, shares a nongroup-specific antigenic component with cat leukemia virus (Rickard strain) and cat sarcoma virus (Gardner strain), but the group-specific anti-

genic determinant of this human virus is similar to that of the swine and simian viruses. IgG antibodies could be substituted for whole serum in the Ouchterlony precipitation reaction with these oncornaviruses.

- 6217 NEW ANTIGENS IN CELLS TRANSFORMED BY SV40. III. PRESENCE OF AN ANTIGEN CODED BY SV40 ON THE SURFACE OF VARIOUS CELL LINES TRANSFORMED BY THIS VIRUS. (Fr.) Duthu-Herbet, A. (Sci. Res. Inst. Cancer, Villejuif, France), M. Kress, C. de Vaux Saint Cyr. *Int J Cancer* 12(1):290-300, 1973.

A slow cytotoxic activity was previously demonstrated *in vitro* in sera from hamsters with tumors induced by injection of TSV₅Cl₂ cells (originating from a primary tumor induced in the hamster by SV40) and in sera of hamsters immunized with TSV₅Cl₂ cells or with SV40 or its purified capsids when these sera were incubated with fresh guinea pig complement and SV40-transformed cell lines from hamsters, mice or rats. The antigen responsible for this slow cytotoxic activity is coded by the SV40 genome and is associated with the cytoplasmic membranes of the transformed cells. By absorbing antisera with subcellular fractions, the antigen responsible for slow cytotoxic activity has been shown to be similar to the C antigen found in the cytoplasm of cells transformed by SV40. Immunofluorescence studies revealed that it differs from the S antigen. Research is in progress to determine the relationship between the antigen responsible for slow cytotoxic activity and tumor transplantation antigen.

- 6218 α_1 -FETOPROTEIN IN LIVER DISORDERS AND METABOLIC DISEASES IN CHILDREN. (Fr.) Buffe, D. (Sci. Res. Inst. Cancer, Villejuif, France) and C. Rimbaut. *Biomedicine* 19(4):172-176, 1973.

α_1 -Fetoprotein (FP) was determined by immunodiffusion and radioimmunodiffusion in sera from 264 children, aged two months to 15 yr, with primary or secondary liver tumors and nonmalignant liver disorders. Positive tests for FP were obtained on sera from 39 of 41 children with primary hepatomas. Depending upon its initial level in the serum, FP disappeared within eight to 20 days after surgical removal of the tumor. The only exceptions were cases in which the tumor had not been completely removed or in which a recurrence developed. Negative tests for FP were obtained in 77 children with hepatic metastases, six with hamartomas, four with angiomas, one with an adenoma, one with a hydatid cyst, two with traumatic hemobilia and 62 with hepatomegaly and posthepatic cirrhosis. Of 40 children with hepatitis, 13 had positive tests for FP. FP was present only for a short time and in low concentrations in all but two severe cases of hepatitis. Of 25 children with metabolic diseases, only four of five with tyrosinosis had positive tests for FP. In one case, which was followed for 2 1/2 yr, the FP concentration decreased as diet therapy reduced elevated serum methionine and cystine levels; a hepatoma was ruled out at autopsy. A sister of this patient also had the same disorder of amino acid metabolism and a positive test

for FP. The one patient with tyrosinosis and a negative test for FP had normal serum methionine levels. It is concluded that the presence of FP in serum is not necessarily diagnostic for hepatomas in children.

- 6219 CARCINOEMBRYONIC ANTIGEN. (E.) Haverback, B. J. (U. Southern California, Med. Ctr., Los Angeles) and B. J. Dyce. *Public Health Lab* 31(6):182-188, 1973.

Carcinoembryonic antigen (CEA), which was originally found in adult human tissues only in adenocarcinomas of the gastrointestinal tract and their metastases, has been found in low concentrations in normal adult tissue and in higher concentrations in other cancerous tissues. The highest levels of CEA are found in colonic carcinomas. A masking substance to CEA was found in low concentrations in a number of carcinomas; in two gastric carcinomas, it occurred in high enough concentrations to completely mask the presence of CEA. Six CEA peaks have been separated by isoelectric focusing; the amino acid composition and sugar moieties of the antigen have been delineated. The value of the plasma level of CEA in the detection of neoplastic disease depends on a number of factors, so that experienced judgment must be used in interpreting CEA levels. Plasma levels of 2.5 ng/ml or less are generally considered normal, while values above 7 or 8 ng/ml often indicate the presence of a neoplasm. The great majority of patients with colonic cancer have high CEA levels, as do about 70% of those with pancreatic carcinoma.

- 6220 *IN VITRO* LYMPHOCYTE BLASTOGENESIS: A PROGNOSTIC TEST IN PATIENTS WITH NEOPLASTIC DISEASE. (E.) Han, T. (Roswell Park Mem. Inst., New York State Dept. Hlth., Buffalo). *J Surg Oncol* 5(6):567-574, 1973.

The *in vitro* lymphocyte response to phytohemagglutinin (PHA) was studied in patients with Hodgkin's disease, bronchogenic carcinoma and chronic lymphocytic leukemia; the results were correlated with the clinical and immunologic status of these patients. The lymphocyte blastogenesis was normal among patients in remission, except in a few instances in which depression could be attributed to antecedent therapy. The PHA response varied greatly among patients with active Hodgkin's disease and appeared to be affected by a variety of factors related to the disease and to treatment. The mean PHA response in patients with bronchogenic carcinoma was significantly depressed as compared to that of normal subjects. There was a correlation between lymphocyte blastogenesis and the extent of the disease or survival of these patients with bronchogenic carcinoma. The PHA response was markedly depressed and delayed in almost all patients with active chronic lymphocytic leukemia, and it was slightly or moderately depressed, but somewhat delayed, in some patients in remission. The lymphocyte response correlated well with the duration of disease, the status of therapy, the status of disease, the degree of lymphocytosis, and the immunologic status of the patients with chronic lymphocytic leukemia.

6221 QUANTITATIVE IMPAIRMENT OF PRIMARY INFLAMMATORY RESPONSE IN PATIENTS WITH CANCER.

(E.) Johnson, M. W. (U. California Sch. Med., San Francisco), H. I. Maibach and S. E. Salmon. *J Natl Cancer Inst* 51(3):1075-1076, 1973.

Cutaneous inflammation to graded doses of benzalkonium chloride (BC; 5, 2, 1%) and croton oil (10%) was studied in patients with cancer. The group studied consisted of 9 patients with cervical cancer, 4 with uterine cancer, 5 with bladder cancer and 4 with other types of cancer; they were all undergoing localized irradiation and none had received chemotherapy. Frequency of inflammatory response to the intense irritant, 5% BC, was not depressed in the patients, whereas frequency of response to the milder irritants (2 and 1% BC and 10% croton oil) was significantly depressed relative to a control group of 10 normal adults. Other studies of altered inflammatory response in cancer patients are briefly discussed.

6222 TUMOR-ASSOCIATED FETAL ANTIGENS IN HUMAN TUMORS. (E.) Avis, P. (Fac. Med.,

Memorial U. Newfoundland, St. John's, Canada), M. I. Biol and M. G. Lewis. *J Natl Cancer Inst* 51(3):1063-1066, 1973.

Antisera prepared by giving New Zealand white rabbits injections of perchloric acid extracts of 12-wk human fetuses demonstrated the presence of fetal antigenic components on the surface of human malignant melanoma cells and the cells of other human tumors. The antifetal serum reacted only with the surface of tumor cells and fetal cells, not with a number of normal adult cells. The relationship with carcinoembryonic antigen and other fetal antigens is briefly discussed. The antifetal serum did not block or was not blocked by tumor-specific surface membrane reactions in the same individuals.

6223 A MICRO-COLONY-INHIBITION METHOD FOR QUANTITATION OF TUMOR IMMUNITY. (E.)

Haskill, J. S. (Dept. Path., Queens U., Kingston, Ontario, Canada). *J Natl Cancer Inst* 51(5):1581-1588, 1973.

A new micro-colony-inhibition (Micro-CI) system was developed to quantitate syngeneic and allogeneic immunity against tumor-associated antigens and to compare the antigenicity of different tumor cells. It is relatively simple to use and appears to be at least as sensitive as the chromium-release method. The new method requires fewer target cells than any of the other cellular immunity assays. To test the system, cloned and mixed lines of the SaD₂ fibrosarcoma line, the CaD₂ mammary carcinoma line, the T 1699 mammary adenocarcinoma line, the L1210 leukemia line, and the mastocytoma P815 line were cultured. Micro-CI systems were then set up consisting of tumor cells or tumor cells mixed with CBA or DBA/2 spleen cells. Syngeneic immunity against tumor-associated antigens was demonstrated by the preincubation of spleen cells from either immunized or tumor-bearing animals. Most of the tumors studied

showed similar sensitivity to CI regardless of their varying plating efficiencies and widely varying levels of surface H-2 antigen.

6224 SPECIFIC COLONY INHIBITION BY HUMAN LYMPHOMA CELLS ON AN ESTABLISHED HUMAN LYMPHOMA CELL LINE. (E.)

Drewinko, B. (U. Texas M.D. Anderson Hosp., Houston), G. Mavligit, U. Ambus, C. Pritchett, J. Gutterman and E. Hersch. *J Natl Cancer Inst* 51(4):1377-1378, 1973.

Freshly obtained human lymphoma cells were cocultivated with target cells derived from long-term cultures of human lymphoma, sarcoma, and melanoma cells and from Chinese hamster ovary. The fresh lymphoma cells inhibited colony formation of the lymphoma line but not of the other lines. It is suggested that the lymphoma cells had the capacity of "autoaggressive" immunologic reactions.

6225 MIGRATION-INHIBITING EFFECT OF SERA FROM PATIENTS WITH BURKITT'S LYMPHOMA. (E.)

Cochran, A. J. (The Western Infirmary, Glasgow, Scotland), G. Klein, R. Kiessling and P. Gunven. *J Natl Cancer Inst* 51(5):1431-1436, 1973.

Sera from 25 of 30 Burkitt's lymphoma (BL) patients inhibited the migration of cell suspensions from BL biopsies and tissue cultures in a capillary tube migration assay. Leukemic peripheral blood-cell migration was inhibited by 13 of 21 BL sera. Weak migration inhibition was seen only occasionally with sera from clinically disease-free Europeans, from African patients with nasopharyngeal carcinoma, and from African patients with tonsillitis. Inhibitory activity was exhibited by sera from 24% of the relatives and neighbors of the BL patients. The donors of positive sera tended to be <10 yr old and showed some tendency toward geographic clustering. Inhibitory activity was maximal in the macroglobulin fraction in the 3 sera fractionated on Sephadex, but subsidiary activity was noted in 2 of these sera in the post-albumin fraction. Administering 2-mercaptoethanol and heating the serum to 56 C for 30 min abolished the inhibitory activity. The specificity of the active fraction was not identified, nor could the inhibitory activity be related to the levels of antibody to Epstein-Barr virus-related antigens. The inhibitory factor(s) may be part of an inhibitory feedback mechanism.

6226 EFFECT OF HETEROLOGOUS TRANSPLANTATION OF H 4-II-E RAT HEPATOMA CELLS INTO THE CHEEK POUCH OF HYDROCORTISONE TREATED HAMSTERS. (E.)

Muragishi, H. (Nagoya U. Sch. Med., Japan) and R. H. Bottomley. *Nagoya J Med Sci* 36(1):49-62, 1973.

Tissue culture H 4-II-E rat hepatoma cells implanted into the cheek pouches of hydrocortisone treated golden hamsters at a concentration of 10⁶ cells per pouch produced tumors which histologically resembled hepatomas. Cells from these tumors were placed back into tissue culture and were transferred twice more into the cheek pouches of hydrocortisone treated

- hamsters and back into tissue culture. At each stage of selection, chromosome counts, karyotypes, and histological and biological characteristics were determined. Cytogenetic studies revealed that the chromosome number in both tumors and explanted cultures shifted and became more selected with each succeeding *in vivo* and *in vitro* passage. The cells from the selected cultures had a much more homogeneous karyotype than cells with the same number of chromosomes from the original H 4-II-E culture. Tumors in the third selection had less hemorrhage and necrosis than in the first and second selections and were slower growing and showed lower transplantability than the original tumors produced by implantation of the H 4-II-E cells. These results indicate that transplantation of tissue culture cells into the cheek pouches of hamsters treated with hydrocortisone results in the selection of cells with a specific chromosomal constitution and altered transplantability and growth rate, suggesting that the chromosomal makeup may determine the biological and immunological characteristics of the cell which allow it to grow under these conditions.
- 6227 IMMUNOCHEMICAL ANALYSIS OF THE SERUM FRACTIONS OF MICE WITH RAUSCHER-LEUKAEMIA. (E.) Toth, F. D. (U. Med. Sch., Debrecen, Hungary), T. Karsai and L. Vaczi. *Acta Microbiol Acad Sci Hung* 20(1):51, 1973.
- 6228 THE RELATIONSHIP BETWEEN RED CELL ACETYLCHOLINESTERASE ACTIVITY AND Ii ANTIGENICITY IN LEUKAEMIA. (E.) Scott, G. L. (St. Thomas' Hosp., London, England), A. Dornhorst and M. R. Rasbridge. *Scand J Haematol* 11:230-235, 1973.
- 6229 MONOCLONAL IgG-LYSOZYME (MURAMIDASE) COMPLEX IN ACUTE MYELOMONOCYTIC LEUKEMIA: AN UNUSUAL FINDING. (E.) Finkle, H. I. (Mt. Zion Hosp., San Francisco, Calif.), K. Brownlow and F. R. Elevitch. *Am J Clin Pathol* 60(6):936-940, 1973.
- 6230 CELL-MEDIATED IMMUNITY TO HERPES SIMPLEX VIRUS IN MAN. (E.) Russell, A. S. (Dept. Med., U. Alberta, Canada). *Am J Clin Pathol* 60(6):826-830, 1973.
- 6231 DIFFERENTIAL EFFECT OF NEURAMINIDASE ON THE IMMUNOGENICITY OF VIRAL ASSOCIATED AND PRIVATE ANTIGENS OF MAMMARY CARCINOMAS. (E.) Simmons, R. L. (Dept. Surg., U. Minnesota, Minneapolis) and A. Rios. *J Immunol* 111(6):1820-1825, 1973.
- 6232 THE ROLE OF CELLULAR IMMUNITY IN CONTROL OF NEOPLASIA. (E.) Bone, G. (Dept. Surg. U. Newcastle upon Tyne, England) and R. Camplejohn. *Br J Surg* 60(10):824-827, 1973.
- 6233 INTRACRANIAL RETICULUM CELL SARCOMA ASSOCIATED WITH IMMUNOGLOBULIN A DEFICIENCY. (E.) Gregory, M. C. (United Oxford Hosp., England) and J. T. Hughes. *J Neurol Neurosurg Psychiatry* 36(5):769-776, 1973.
- 6234 INCIDENCE OF HL-A ANTIGENS IN ACUTE LYMPHOCTIC LEUKEMIA. (E.) Sanderson, A. R. (Children's Hosp. Med. Ctr., Boston, Mass.), G. H. Mahour, N. Jaffe and L. Das. *Transplantation* 16(6):672-673, 1973.
- 6235 STAGE I HODGKIN'S DISEASE. CHANGING CONCEPTS. (E.) Ibrahim, E. (M.D. Anderson Hosp., Houston, Tex.), L. M. Fuller and J. F. Gambel. *S Afr Cancer Bull* 17(3):102-105, 1973.
- 6236 RELATIVE AFFINITY AND AVIDITY OF THE ANTIGEN-BINDING RECEPTORS OF T AND B ROSETTE-FORMING CELLS. (E.) Wilson, J. D. (Walter and Eliza Hall Inst. Med. Res., Melbourne, Australia) and M. Feldmann. *Nature [New Biol]* 245(145):177-180, 1973.
- 6237 CANCER AND IMPAIRMENT OF CELL-MEDIATED IMMUNITY. (E.) Watkins, S. M. (Lister Hosp., Hertfordshire, England). *Lancet* 1(7814):1254-1255, 1973.
- 6238 MEASUREMENT OF CARCINOEMBRYONIC ANTIGEN. (E.) Fleisher, M. (Sloan-Kettering Cancer Ctr., New York, N.Y.), H. F. Oettgen, E. Besenfelder and M. K. Schwartz. *Clin Chem* 19(10):1214-1220, 1973.
- 6239 AMYLOIDOSIS AND MULTIPLE MYELOMA. A REEVALUATION USING A CONTROL POPULATION. (E.) Limas, C. (Baltimore City Hosps., Md.), J. R. Wright, M. Matsuzaki and E. Calkins. *Am J Med* 54(2):166-173, 1973.
- 6240 THE IMMUNOLOGY OF HODGKIN'S DISEASE. (Fr.) Hoerni, B. (Bergonie Fdn., Bordeaux, France), J. Chauvergne and G. Hoerni-Simon. *Bordeaux Med* 5(11):1299-1302, 1972.
- 6241 RADIOIMMUNOLOGICAL DETERMINATION OF ALPHA-FETOPROTEIN. III. SERUM LEVELS IN THE NORMAL ADULT RAT AND IN THE FEMALE DURING GESTATION. (Fr.) Gilli, J. (No affiliation) and R. Masseyeff. *C R Soc Biol (Paris)* 167(6-7):1009-1014, 1973.
- 6242 EVIDENCE FOR SEVERAL CELL POPULATIONS ACTIVE IN ANTIBODY DEPENDENT CELLULAR CYTOTOXICITY. (E.) Zigelboim, J. (U. California Sch. Med., Los Angeles), B. Bonavida and J. L. Fahey. *J Immunol* 111(6):1737-1742, 1973.

6243 ENDOCRINE AND IMMUNOLOGIC STUDIES IN BREAST CANCER. (E.) Hoge, A. F. (U. Oklahoma Hlth. Sci. Ctr., Oklahoma City), J. M. Hartsuck, G. M. Kollmorgen and J. A. Schilling. *Am J Surg* 126(6):722-728, 1973.

6244 ANTIBODIES TO EPSTEIN-BARR VIRUS AT THE AGES OF 6 TO 23 MONTHS IN CHILDREN WITH CONGENITAL HEART DISEASE. (E.) Tallqvist, H. (Aurora Hosp., Helsinki, Finland), W. Henle, E. Klemola, E. Leskinen, K. Niemi, E. Malm and L. Tuuteri. *Scand J Infect Dis* 5(3):159-161, 1973.

6245 CARCINOEMBRYONIC ANTIGEN IN CANCER OF THE FEMALE REPRODUCTIVE SYSTEM: ITS DETECTION IN SERUM BY A MICRORADIOIMMUNOASSAY. (E.) Khoo, S. K. (Roy. Melbourne Hosp., Australia) and E. V. Mackay. *Aust NZ J Obstet Gynaecol* 13(2):107-113, 1973.

6246 HISTAMINE RELEASE FROM PERITONEAL MAST CELLS OF TUMOR SUSCEPTIBLE RATS FOLLOWING PERIODS OF TUMOR GROWTH AND SENSITIZATION WITH TUMOR ANTIGEN AND B. PERTUSSIS. (E.) Sweeney, W. T. (Med. Coll. Virginia, Richmond) and H. R. Seibel. *Int Arch Allergy* 45(5):789-794, 1973.

6247 SPECIFICITY OF *IN VIVO* TUMOR REJECTION ASSESSED BY MIXING IMMUNE SPLEEN CELLS WITH TARGET AND UNRELATED TUMOR CELLS. (E.) Røllinghoff, M. (Walter and Eliza Hall Inst. Med. Res., Victoria, Australia) and N. L. Warner. *Proc Soc Exp Biol Med* 144(3):813-818, 1973.

6248 ANTIBODY RESPONSE IN HODGKIN'S DISEASE AND OTHER LYMPHOMAS RELATED TO HL-A ANTIGENS, IMMUNOGLOBULIN LEVELS AND THERAPY. (E.) Sybesma, J. P. H. B. (Univ. Hosp., Utrecht, Germany), J. D. Holtzer, E. Borst-Eilers, M. Moes and B. J. M. Zegers. *Vox Sang* 25(3):254-262, 1973.

6249 IMMUNE RESPONSE TO A SYNGENEIC RAT TUMOUR: EVOLUTION OF SERUM CYTOTOXICITY AND BLOCKADE. (E.) Flannery, G. R. (Monash U. Med. Sch., Melbourne, Australia), P. J. Chalmers, J. M. Rolland and R. C. Nairn. *Br J Cancer* 28(4):293-298, 1973.

6250 IMMUNOGLOBULIN BIOSYNTHESIS BY NORMAL AND LEUKEMIC HUMAN PERIPHERAL BLOOD LYMPHOCYTES. (E.) Nies, K. M. (Dept. Med., Los Angeles County, Calif.), M. A. Oberlin, J. C. Brown and M. S. Halpern. *J Immunol* 111(4):1236-1242, 1973.

See also:

- * (Rev): 6001, 6006, 6008, 6023
- * (Chem): 6036, 6041
- * (Viral): 6119, 6123, 6125, 6126, 6130, 6133, 6146, 6159, 6166, 6168, 6198

- 6251 THE HISTOGENESIS OF UTERINE ANGIOMATOSIS ("UTERINE STROMATOSIS"). (Ger.) Weiser, G. (Inst. Pathol. Anat., U. Innsbruck, Austria) and A. Propst. *Virchows Arch (Pathol Anat)* 361(3):229-239, 1973.

Electron microscope examination of tumors from two women, aged 52 and 31 yr, resp., with "uterine stromatosis" showed that four types of cells were present: (1) undifferentiated cells, (2) vascular-type cells, (3) endothelial-like cells and (4) pericyte-like cells similar to those found in the vascular musculature. The undifferentiated cells were characterized by a larger number of mitochondria than the other types, a few solitary cilia, and intracytoplasmic lipid vacuoles with or without myelin figures. All four cell types contained vacuoles and very small pinocytotic vesicles, but these structures were rarely found in the undifferentiated cells. External lamellae, which were either fragmented or formed aggregates in undifferentiated cells, were present in all four cell types. These findings confirm that "uterine stromatosis" does not really involve the uterine stroma which never forms external lamellae. Further investigations are necessary to determine whether and to what extent this type of angioma originates from the uterine vessels.

- 6252 MORPHOLOGICAL AND HISTOCHEMICAL CHANGES IN THE OVARIES IN UTERINE PRECANCER AND CANCER. (Rus.) Dobrynin, V. A. (S. V. Kurashov Med. Inst., Kazan, USSR) and K. D. Gataullin. *Arkhh Patol* 35(8):38-41, 1973.

Histological and histochemical examinations were made of ovaries taken from 58 women, aged 30-69 yr, with precancerous conditions of the uterus (carcinoma *in situ*, leukoplakia, glandular and glandular-papillary erosion of the cervix, glandular hyperplasia, and endometrial polyposis) and from 76 women with uterine cancer (44 with nonkeratinized squamous cell carcinomas of the cervix, 2 with cervical adenocarcinomas and 30 with uterine adenocarcinomas). In women with precancer the earliest changes consisted of deposits of hyaluronic acid in the walls of blood vessels, primarily arteries. In older patients and patients with more advanced precancer, the hyaluronic acid was replaced by chondroitin sulfate and neutral mucopolysaccharides. Simultaneous proliferation of elastin and collagenosis of argyrophilic fibers resulted in thickening and sclerosis of the walls of blood vessels. In cancer patients these changes were observed in arteries, veins and lymphatics. In menstruating patients corpora lutea were found in 20 (44.4%) of women with uterine precancer and in 12 (30%) of those with uterine cancer. Ovarian cysts were present in 40 patients (68.9%) with precancer and in 47 (61.8%) of those with cancer. Hormonally inactive cysts were significantly more common in cancer patients (51.3%) than in patients with uterine precancer (29.3%). Glycogen, phospholipids, neutral lipids (including cholesterol) and granules of ascorbic acid were present in hormonally active cysts and areas of stromal hyperplasia but were absent or pres-

ent in only trace quantities in hormonally inactive cysts. In uterine cancer and precancer two phases of hormone imbalance are considered to be present. The first phase, which is more common in precancer, is caused by classical estrogens while the second phase, which is more common in cancer, results from an imbalance caused largely by phenolic steroids. However, since precancerous conditions do not invariably lead to cancer, it is suggested that other systemic or local factors must be involved in malignant transformation.

- 6253 EXPERIMENTAL CARCINOMA OF THE PORTIO UTERI IN MICE TREATED WITH NORHYDROXYPROGESTERONE CAPROATE. (Ger.) Herzog, R. (Path. Inst., U. Freiburg, Germany), H. Grimm and W. Sandritter. *Beitr Pathol* 148:230-241, 1973.

Knotted threads soaked in beeswax and methylcholanthrene (MC) were introduced into the uterine portio in 290 female NMRI mice by winding them around the uterine horn; the dose of MC was about 3.5 mg. In addition, 200 of the mice were injected s.c. with 200 µg/week of norhydroxyprogesterone caproate (NHPC) in oil, starting one wk after introduction of MC. Vaginal smears obtained from these mice at weekly intervals showed that NHPC had a proliferative effect on all but 30 mice and reduced the tendency of the epithelium to keratinize. Cytologically atypical cells started to appear four wk after introduction of MC in both groups of mice. Carcinomas developed in MC-treated mice 10 wk and in MC + NHPC-treated mice 9 wk after introduction of the carcinogen. In 3 of the 45 MC + NHPC-treated mice which survived for 16 wk after MC introduction, carcinomas had metastasized to the omentum and liver. DNA stem lines were frequently found in the hyperdiploid region and in carcinomata *in situ* 8 wk after introduction of MC. NHPC masked DNA stem lines by increasing DNA values. DNA values in the hypertetraploid to octaploid range were found after four wk in three mice given MC + NHPC; these cells disappeared before DNA stem lines were detected. This phenomenon is attributed to the cumulative action of MC and NHPC. Apparently the effect of the carcinogen outweighs or eliminates that of NHPC and increased DNA values decrease during further development of the tumor.

- 6254 CARCINOMA DEVELOPMENT ASSOCIATED WITH INFLAMMATORY ULCEROHEMORRHAGIC CHANGES IN THE COLON AND RECTUM. (Ger.) Roenspies, U. (Cantonal Hosp., Lausanne, Switzerland) and F. Sae-gesser. *Helv Chir Acta* 40(5/6):719-726, 1973.

Eight carcinomas of the colon and rectum developed in 6 of 104 patients with ulcerative colitis. The mean age of patients who developed cancer was 43 yr, while the mean age at diagnosis of a primary colonic or rectal carcinoma is 64 yr in the general population. Patients with cancer had histories of ulcerative colitis which dated back 7-23 yr (mean 16 yr). The mean survival time for these patients was 17.7 months; five of the six patients have died. An analysis of 23 reported cases of carcinomas of the colon and rectum which developed in patients with

Crohn's disease showed that patients can be classified into two groups. The first group (11 patients) had a history of Crohn's disease dating back less than one yr; the mean age was 58 yr. The second group (12 patients) had Crohn's disease for an average of 11 yr; the mean age was 44 yr. It is concluded that the association between cancer and Crohn's disease is fortuitous in patients belonging to the first group. Of 21 patients who developed radiation-induced colitis, three developed tumors: sigmoid adenocarcinomas in two cases and a peritoneal fibrosarcoma in one. These patients had received radiation therapy for an inguinal reticulum cell sarcoma, a carcinoma of the corpus uteri and an ovarian carcinoma 8, 17 and 4 yr, resp. before development of the secondary tumor. Although no direct relationship was found between radiation-induced colitis and tumor development, this association is probably not fortuitous. Of 29 patients with an ischemic colopathy, 6 had colonic stenosis which was caused by stenosing carcinomas in two patients (an 84-yr-old woman with a rectosigmoid adenocarcinoma and an 80-yr-old man with a carcinoma of the left colonic flexure).

6255 SOME EVIDENCE CONCERNING THE SWEAT DUCT ORIGIN OF CLEAR CELL ACANTHOMA. (E.)

Lingdren, A. G. H. (St. Göran's Hosp., Stockholm, Sweden) and E. Neumann. *Acta Dermatovenereol (Stockholm)* 53(6):511-514, 1973.

Two cases of clear cell acanthoma are reported, one of which occurred in a 47-yr-old woman, and the other which occurred in a 71-yr-old woman. In both cases a direct continuity could be demonstrated between pale cells concentrically arranged around sweat duct lumen and the acanthotic part of the epidermis. The absence of a sharp demarcation between pale cells and the surrounding normal basal layer indicates that the acanthomas did not represent inflammatory reactive tumors with a disturbed keratinization. A possible genetic relationship to the poral epithelium is suggested.

6256 FUNCTIONAL DISORDERS OF THE HEMATOPOIETIC SYSTEM IN THE PRELEUKEMIC PHASE OF ACUTE LEUKEMIA. (Ger.) Heimpel, H. (Ctr. Intern. Med. Pediatrics, U. Ulm, Germany), E. Kleihauer, A. Olischläger and W. Queisser. *Med Klin* 67(32):1004-1011, 1972.

Quantitative changes in the blood picture and a variety of functional disturbances in various cell series were observed in a 13-yr-old boy for about one yr before he developed manifest signs of acute stem cell leukemia. The boy presented with headaches, nausea and continuous vomiting but had no signs of hemorrhagic diathesis. At this time he had severe anemia with increased but very inadequate erythropoiesis and a probable reduction in the RBC life. Fetal hemoglobin was increased as were RBC protoporphyrin and coproporphyrin. Sideroblasts were slightly increased, relative decreases had occurred in RBC pyruvate kinase and glutathione reductase activities, and WBC alkaline phosphatase was increased.

Pelger-like neutrophils were found, and morphological changes were observed in the megakaryocytes which were very small. Chromosome studies, which were performed only when blast cells constituted 40% of all nucleated cells in the bone marrow, showed a hypodiploid stem line with a 45 XY, C- karyotype. These changes are regarded as manifestations of a leukemia transformation of normal stem cells and suggest that in the preleukemic phase of acute leukemia the stem cells have not yet lost their ability to differentiate into morphologically identifiable cells which are not manifestly leukemic. As the disease advances, transformed stem cells do lose this ability.

6257 THE BIOPATHOLOGY OF CARCINOMA OF THE CERVIX. (Fr.) Nogales, F. (1st Gynecol. Clin., U. Madrid, Spain) and H. Martinez. *Rev Fr Gynecol Obstet* 67(4):243-260, 1972.

The development of cervical carcinoma was investigated by histological examinations of 156 surgical specimens obtained at total hysterectomy. Gross and microscopic findings in stage I-IV cervical carcinomas conflicted with the generally accepted view that these tumors grow primarily by infiltration. Tumors originated from the columnar epithelium by malignant metaplasia and grew in existing spaces in the glands and blood and lymph vessels. In this way, a spreading tumor nodule formed which obliterated its own outline. The parametrial edge was generally resistant to obliteration and, with a few exceptions (two cases of stage IV carcinoma), was not infiltrated by the tumor nodule. Parametrial involvement was observed in only 26 of the 156 specimens examined (18.5%). In 19 cases this involvement resulted from metastases into small lymph nodes and vessels; in five cases metastasis occurred *via* blood vessels. It is considered that the main factor responsible for recurrences is vaginal dysplasia at the margin of the tumor which was observed in 71% of these specimens. Thus, extensive vaginal excision is of more therapeutic value than parametrial excision although the value of the latter should not be underrated. Tumors extended into the corpus uteri in only 4.6% of the specimens examined. In only one case did the tumor spread along the surface, filling the glandular spaces of the isthmus and then the cervix up to the cavity of the corpus uteri. Because of discrepancies between the conventional grading system and the findings of this study, it is recommended that the conventional grading system be used to evaluate the degree of surgical difficulty but not to explain the way in which the tumor spreads.

6258 MEGAESOPHAGUS: A PRECANCEROUS STATE. (Ger.) Müller, H. P. (Cantonal Hosp., Aargau, Switzerland) and H. K. Streuli. *Helv Chir Acta* 40(5/6):783-786, 1973.

A 67-yr-old woman with a 17-yr history of achalasia was treated with diet and spasmolytics, but about one yr later she began retching with increased salivation and finally became unable to swallow. X-ray examination showed pronounced stenosis of the cervical esophagus, and a biopsy revealed the pres-

ence of a squamous cell carcinoma. Because of the patient's poor general condition and the high location of the tumor, she was subjected to radiotherapy and bougienage. After four months the tumor had regressed enough so that a segmental resection and dilatation of the cardia could be performed. The patient showed good progress after surgery, but an abscess and necrosis developed in the anastomosis after 5 wk, resulting in the formation of a trachoesophageal fistula and massive arterial erosion which resulted in the patient's death. No tumor was found at autopsy, and normal healing had not occurred in the irradiated esophagus. The literature indicates that the incidence of esophageal carcinoma is significantly increased in subjects with long histories of achalasia due to mucosal irritation caused by stasis and esophagitis. It is recommended that patients with achalasia be examined regularly for evidence of cancer.

- 6259 EXPERIMENTAL ANASTOMOTIC CARCINOMAS: A CONTRIBUTION TO THE PATHOGENESIS OF GASTRIC STUMP CARCINOMAS. (Ger.) Dahm, K. (Anat. Inst., U. Hamburg, Germany) and B. Werner. *Langenbecks Arch Chir* 333:211-236, 1973.

Five wk after resection of 3/4 to 4/5 of the glandular stomach, including the pylorus, and Billroth I or Billroth II gastroenterostomies, male Wistar rats were given N-methyl-N'-nitro-N-nitrosoguanidine (MNNG; 120 mg/liter *ad libitum* with drinking water). Controls consisted of 24 treated nonoperated rats and 10 operated untreated rats. In 37 treated rats with Billroth I gastroduodenostomies, 13 adenocarcinomas and 2 malignant polyps were found; 80% of these tumors were located in the anastomosis and 20% in the gastric stump. In 29 treated rats with Billroth II gastrojejunostomies, 8 adenocarcinomas and 2 cirrhotic carcinomas were diagnosed; all of the tumors originated in the anastomosis. Most of the tumors were detected after 29-31 wk of MNNG treatment, but one rat had a large cystadenoid carcinoma, diagnosed at biopsy, after 17 wk of treatment. No metastases were detected. Almost all of these animals, whether they had carcinomas or not, had erosions or ulcers near gastrojejunostomies or polypous changes near gastroduodenostomies. In contrast to operated untreated controls, evidence of continual bile reflux was found in the stomachs of all treated operated rats. With one exception, a rat with a sarcoma of the small intestine, all MNNG-induced changes were limited to the glandular stomach. Precancerous changes (adenomatous hyperplasia) were observed in the stomachs of 12 of 37 treated rats with Billroth I gastroduodenostomies, in 6 of 29 with Billroth II gastrojejunostomies, in only one unoperated treated control and in none of the operated untreated controls. These precancerous changes occurred preferentially in the anastomotic region. These findings indicate that surgery in itself cannot cause cancer unless the stomach is also exposed to exogenous carcinogens. Although this is considered a good animal model of carcinoma of the gastric stump, the incidence of cancer was about the same after Billroth I and Billroth II procedures in rats, while in man the incidence of cancer is higher after the Billroth II

procedure. MNNG is broken down more rapidly in alkaline media. Therefore, reflux of alkaline duodenal or jejunal juice and the reduced capacity of the gastrectomized stomach to secrete HCl causes an increase in the rate at which MNNG is broken down, particularly near the anastomosis. Thus, the higher concentration of alkylating methyl groups near the anastomosis favors the development of cancer at that site.

- 6260 THE AETIOLOGY, PATHOGENESIS AND HISTOLOGICAL STRUCTURE OF KIKUTU-BURSA (KENYA) AND TUMORAL CALCINOSIS (UGANDA). (E.) Maathuis, J. B. (no affiliation) and J. W. Koten. *Trop Geogr Med* 25(3):307-309, 1973.

- 6261 HEMANGIOPERICYTOMA IN SCALP - CASE REPORT WITH SPECIFIC REFERENCE TO ITS HISTOGENESIS BY ELECTROMICROSCOPIC AND CELL-CULTURE STUDIES. (Jap.) Matsutani, M. (Nat'l. Cancer Ctr. Hosp., Tokyo, Japan), K. Takakura, T. Seto and Y. Tokoro. *Brain Nerve (Tokyo)* 25(11):1429-1437, 1973.

- 6262 PRECANCEROUS CONDITIONS OF THE SKIN. (Fr.) Delacretaz, J. (Lucerne, Switzerland). *Helv Chir Acta* 40(5/6):561-568, 1973.

- 6263 INTESTINAL POLYPOSIS. (Ger.) Mutzner, F. (Cantonal Hosp., St. Gallen, Switzerland), R. Amgwerd and N. Markoff. *Helv Chir Acta* 40(5/6):747-750, 1973.

- 6264 THE CLINICAL SIGNIFICANCE OF PRELIMINARY STAGES OF MALIGNANT TUMORS IN THE SMALL AND LARGE INTESTINE AND RECTUM. (Ger.) Jekic, M. (Gen. Hosp., Zemun-Beograd, Yugoslavia). *Helv Chir Acta* 40:743-746, 1973.

- 6265 PATHOMORPHOLOGY OF THE CHANGES IN EPITHELIUM OF PERIPHERAL BRONCHI IN CHRONIC PULMONARY DISEASES. (Pol.) Witkowski, F. (Inst. Oncol., Gliwice, Poland). *Patol Pol* 24(1):85-94, 1973.

See also:

- * (Rev): 6005, 6013, 6015
- * (Chem): 6034, 6095
- * (Viral): 6133, 6198

- 6266 MITOTIC ACTIVITY IN EPIDERMAL CARCINOMA OF THE UTERINE CERVIX. (E.) Siracky, J. (Cancer Res. Inst., Bratislava, Czechoslovakia) and E. Siracka. *Neoplasma* 20(6):665-669, 1973.

Mitotic activity was investigated in two series of patients with epidermal carcinoma of the uterine cervix. In the first series, four different areas within the same tumor were examined for topographic variations, and in the second group, mitotic activity of the primary tumor was compared with that of the secondary deposits in the pelvic lymph nodes. No significant topographic variations in mitotic activity were discovered within the same tumor. In metastatic cancer, higher mitotic activity was found in many of the investigated cases, when compared with that of primary tumor. Average values of mitotic activity of the tumor compared with the histologic degree of differentiation do not seem to conform to criteria accepted for the proliferation characteristics of the respective histologic types of epidermal carcinoma.

- 6267 EPIDEMIOLOGY OF BREAST CANCER AND PRECANCER. (Rus.) Zhivetskii, A. V. (Chernovtsy Med. Inst., USSR). *Vrach Delo* (11):61-64, 1973.

In 1966-1969, a questionnaire survey was made of 2364 women living in Northern Bukovina: 591 had precancerous breast conditions, 591 had breast cancer and 1182 were normal controls. Factors which correlated significantly with breast cancer and precancer were mechanical trauma (carrying farm produce in heavy bags, wearing tight bras), unsatisfactory sex life, late marriage, fewer children, shorter periods of breast feeding, neuropsychic trauma, early onset of menopause, premenstrual discomfort and lactation disorders.

- 6268 LARGE-BOWEL CANCER IN HAWAIIAN JAPANESE. (E.) Haenszel, W. (Nat'l. Cancer Inst., Bethesda, Md.), J. W. Berg, M. Segi, M. Kurihara and F. B. Locke. *J Nat'l Cancer Inst* 51(6):1765-1779, 1973.

Study of 179 Japanese patients with bowel cancer and 357 hospital controls in Hawaii revealed excess risks for persons who regularly ate Western-style meals only. The similarity in findings for Issei and Nisei sharply contrasts with results previously reported for stomach cancer in Issei and Nisei, where the reduced risk among persons regularly eating Western-style meals only was limited to the second-generation Nisei. Bowel cancer was associated with consumption of specific foods. Bowel cancer patients ate meats, legumes, and starches more frequently, with the case-control disparity being less pronounced for individuals consuming starches than for those eating meat and legumes. Beef and string beans were the major contributors to the meat and legume effects. There seemed to be separate effects for beef, string beans, and starches, and the case-control contrasts were strengthened when various combinations of foods were considered. Points of consistency between the

Hawaii study and other evidence are noted. The findings on beef may narrow the area of search for etiologic factors. Beef is higher in saturated fats than other sources of animal protein, such as chicken, pork, and fish, and attention might be directed to mechanisms involving the direct action of saturated fatty acids or indirectly via bile metabolites and their cholesterol precursors.

- 6269 CANCER OF THE ENDOMETRIUM, AN IMPROVED EPIDEMIOLOGICAL ASSESSMENT. (E.) Bonham, D. G. (Postgrad. Sch. Obstetrics Gynecology, U. Auckland, New Zealand) and R. J. G. Bonham. *Aust NZ J Obstet Gynaecol* 13(3):172-183, 1973.

A computerized life-table technique was used to follow up 535 cases of endometrial carcinoma diagnosed between 1946 and 1969. Marriage rates were higher among the survivors (12.3%) than among those who died (9.7%), and survivors had a lower mean age at diagnosis (57.7 years) than did the nonsurvivors (64.2 years). Women in whom diagnosis was made after menopause had a higher mortality rate, but were able to survive longer in relative equilibrium with the malignant process. The survival rate decreased with increasing age in all women. The lower stages of disease were associated with better survival and longer resistance; the data indicate that patients with *in situ* or Stage 0 lesions should be excluded from survival tables. There was a trend towards longer equilibrium with the disease in patients with the better differentiated tumors. The age-related survival pattern appeared to occur independently of the stage-related pattern. In the younger women, surgery alone gave better survival rates than radiotherapy followed by surgery.

- 6270 EPIDEMIOLOGICAL AND QUANTITATIVE RELATIONSHIPS BETWEEN MESOTHELIOMA AND ASBESTOS ON TYNESIDE. (E.) Ashcroft, T. (Dept. Path., U. Newcastle upon Tyne, Great Britain). *J Clin Pathol* 26(11):832-840, 1973.

Thirty-five necropsied cases of diffuse malignant mesothelioma of the pleura and six cases of mesothelioma of the peritoneum are reported. Occupational histories from 40 cases showed that 32 cases (80%) were definitely exposed to asbestos, six cases (15%) were probably exposed, and two (5%) had no known exposure. The mean latent interval was 34 yr. Occupational histories of 56 control patients matched in pairs for age and sex with 28 of the mesothelioma cases revealed definite exposure to asbestos in 12 controls (21%), probable exposure in 11 (20%), and no evidence of exposure in 33 (59%). The difference in the incidence of exposure between mesotheliomas and controls is statistically highly significant. Six-micron histological sections of lung, available in 39 mesothelioma cases, contained coated asbestos fibers in 36 cases (92%). Sixteen cases of mesothelioma showing fibers were free of asbestosis; asbestosis was slight in 14 cases, moderately severe in five cases, and severe in one case. The incidence of asbestos bodies in sections from mesothelioma cases was significantly higher than in a previously

reported series of routine necropsies examined by lung smear. Counts of coated and uncoated asbestos fibers were performed on samples of lung tissue from 33 mesothelioma cases. No fibers were identified in one case and only occasional coated fibers were found in a second case. The remainder gave counts ranging from 154 thousand to 684 million fibers per gram dry wt. Uncoated fibers were invariably present and usually comprised 50 to 80% of the count. No relationship was found between total fiber count and the latent period of the mesothelioma. Fiber counts were also performed on lung samples from 18 smear-positive and 30 smear-negative routine necropsies. Cases with numerous coated fibers in the smear gave total fiber counts similar to those of mesothelioma cases without asbestosis. Routine cases with only one fiber in the smear usually yielded only occasional fibers on analysis. Coated and uncoated fibers were found in 13 out of 30 smear-negative cases, indicating a true incidence of 56% of exposure to asbestos in the whole necropsy series. When compared with the mesothelioma series the difference in incidence of fibers remains statistically significant. The data suggest that, on Tyneside, exposure to asbestos sufficient to cause an appreciable risk of developing mesothelioma has usually occurred through occupational exposure rather than by general environmental pollution by asbestos.

- 6271 CASE-CONTROL STUDY OF HODGKIN'S DISEASE.
I. RESULTS OF THE INTERVIEW QUESTIONNAIRE.
(E.) Newell, G. R. (Tulane Med. Ctr., New Orleans, La.), W. Rawlings, B. K. Kinnear, P. Correa, B. E. Henderson, R. Dworsky, H. Menck, R. Thompson and W. W. Sheehan. *J Natl Cancer Inst* 51(5):1437-1441, 1973.

The etiology of Hodgkin's disease was studied using case-control data from patients in New Orleans and Los Angeles. The data did not confirm tonsillectomy, appendectomy, or infectious mononucleosis as significant risk factors in Hodgkin's disease. However, an inverse relationship between clinical allergy and Hodgkin's disease was indicated, as was a positive correlation between a prior history of dextroamphetamine use and Hodgkin's disease (especially the nodular sclerosis and mixed-cellularity types). There was no difference between patients and controls regarding prior history of tranquilizer, thyroid medication, hormone, narcotics, or birth control pill use. The data suggest children treated with amphetamines for hyperkinesis may be at high risk for the later development of Hodgkin's disease.

- 6272 CHANGING INCIDENCE OF BREAST CANCER IN JAPANESE-AMERICAN WOMEN. (E.) Buell, P. (Bureau Family Hlth. Services, California Dept. Public Hlth., Berkeley). *J Natl Cancer Inst* 51(5):1479-1483, 1973.

The mortality rates from breast cancer among first- (Issei) and second-generation (Nisei) Japanese-Americans were compared with those for white Americans, Japanese-Hawaiians, Japanese living in Japan

and Polish-Americans. For the period 1950-1960, the breast cancer mortality rates among Japanese-American women were only slightly above the levels prevailing in Japan, although the mortality risks for other site-specific cancers had shifted more markedly toward the levels for white Americans. Data from the Third National Cancer Survey of 1969-1971 indicated that breast cancer risks for Japanese-American women in the San Francisco-Oakland metropolitan area closely approached those for whites. This upward shift occurred among both the Nisei and Issei, the contribution of the Issei being somewhat less than that of the Nisei. The incidence of breast cancer among Japanese-Hawaiians is considerably greater than that among Japanese living in Japan, but is lower than that for Japanese women living in San Francisco. Although Japanese and Polish migrants arrived in the United States at about the same time and both were primarily of rural origin, only the Polish women demonstrated a substantially increased risk of breast cancer by 1950. The Japanese migrants may have retained their traditional culture longer, so that when the strong upward shift in the risk of breast cancer occurred, it reflected the incidence among Japanese-American women potentially exposed to a new culture and environment at preadult and early adult ages.

- 6273 CANCER MORTALITY AMONG FOREIGN- AND NATIVE-BORN CHINESE IN THE UNITED STATES. (E.) King, H. (Natl. Cancer Inst., Bethesda, Md.) and W. Haenszel. *J Chronic Dis* 26(10):623-646, 1973.

The incidence of cancer related deaths among Chinese populations in the United States, Singapore, Taiwan, Hong Kong, and British Columbia between 1959 and 1962 was studied. Compared to U.S. white males, Chinese males in the United States exhibited a 25% higher mortality ratio for all cancer sites combined. The mortality ratios for nasopharyngeal cancer among the Hong Kong Chinese were higher than those for the U.S. Chinese, while those for the Singapore Chinese were lower; the mortality ratios for the Taiwan Chinese were lower than those for any other group. While Chinese males in the United States showed increased mortality ratios for esophageal cancer, the Chinese females showed a low incidence of this type of cancer. U.S. Chinese of both sexes displayed lower mortality ratios for gastric cancer than did the Chinese populations of Taiwan, Hong Kong, or Singapore. Foreign-born Chinese living in the U.S. showed an increase in mortality due to intestinal cancer as compared with other Chinese populations; American-born Chinese living in the U.S. showed a greatly reduced mortality ratio. All of the Chinese populations exhibited high mortality ratios for liver cancer. Chinese males in the U.S. showed somewhat higher mortality ratios for lung cancer than U.S. white males; the male mortality ratios were lower in Singapore, Hong Kong, and Taiwan. The females in all populations showed much higher mortality ratios for lung cancer, but greatly reduced mortality ratios for breast cancer. Mortality from cervical cancer was higher among Asian Chinese than among U.S. Chinese. Mortality due to ovarian cancer was the same for U.S. Chinese as for U.S. whites.

and was higher than among Asian Chinese. All Chinese populations showed low mortality ratios for prostatic cancer. The Asian Chinese populations and the U.S. Chinese males showed low mortality rates for leukemia, while the U.S. Chinese females showed increased mortality from leukemia. The incidence of lymphosarcomas among U.S. Chinese was comparable to that among U.S. whites and higher than among Asian Chinese.

- 6274 TERATOMAS IN CHILDREN: EPIDEMIOLOGIC FEATURES. (E.) Fraumeni, J. F., Jr. (Natl. Cancer Inst., Bethesda, Md.), F. P. Li and N. Dalager. *J Natl Cancer Inst* 51(5):1425-1430, 1973.

The death certificates of 369 U.S. children who died from teratomas in 1960-1968, and the hospital charts of 198 children with this tumor were studied. Mortality rates for girls exceeded those for boys, as contrasted with the usual male preponderance for childhood neoplasia. There was a peak in deaths under age 3, primarily from sacrococcygeal tumors in girls. A rising trend in mortality developed after age 6 for ovarian tumors and after age 14 for testicular tumors. Although the cellular basis for teratomas remains unsettled, the female predominance at various sites is consistent with the concept of a common origin: pluripotential germ cells which account for gonadal teratomas in older children may, if ectopic early in fetal life, give rise in infancy to sacrococcygeal and possibly other extragonadal teratomas. Furthermore, a large proportion of children with sacrococcygeal teratomas had congenital anomalies involving the lower vertebrae, genitourinary system, and anorectum. The array of defects included duplication of the pelvic organs attributable to hindgut twinning. Perhaps certain anomalies near teratomas are not due to the effects of local tumor growth, but result from the same developmental aberration responsible for the formation of teratomas.

- 6275 CLONOGENIC CAPACITY OF PROLIFERATING AND NONPROLIFERATING CELLS OF A TRANSPLANTABLE RAT RHABDOMYOSARCOMA IN RELATION TO ITS RADIOSENSITIVITY. (E.) Barendsen, G. W. (Radiobiol. Inst. TNO, Rijswijk (ZH), The Netherlands), H. Roelse, A. F. Hermens, H. T. Madhuizen, H. A. van Peperzeel and D. H. Rutgers. *J Natl Cancer Inst* 51(5):1521-1526, 1973.

Repeated injections with tritiated thymidine at 4-hr intervals were used to label all proliferating cells (P cells) in a transplantable rat rhabdomyosarcoma to distinguish these cells from nonproliferating cells (Q cells). After the last injection, the tumors were excised and tumor-cell suspensions were prepared. From these suspensions, cells were cultured for different periods of time up to 120 hr. Labeled cells and clones in cultures of different ages were counted by autoradiography, which revealed that Q cells from this rhabdomyosarcoma are equally capable of producing clones of at least 16 cells within 4 days of plating as P cells. The labeling

index of the cells in the 12-hr cultures was equal to that of the cells in the tumors, indicating that the cell-dispersion technique used to prepare a cell suspension from the tumor did not preferentially select P or Q cells. There are two factors which may have been important in inducing the Q cells to begin progress through the cell cycle: an improved access of the cells to nutrients and oxygen; and a change from the closely packed cell population with intercellular contacts and lack of space in the tumor, to the low cell density of the sparse culture *in vitro*.

- 6276 RETROSPECTIVE STUDY ON NASOPHARYNGEAL CARCINOMA. (E.) Lin, T. M. (Natl. Taiwan U. Coll. Med., Taipei), K. P. Chen, C. C. Lin, M. M. Hsu, S. M. Tu, T. C. Chiang, P. F. Jung and T. Hirayama. *J Natl Cancer Inst* 51(5):1403-1408, 1973.

Nasopharyngeal carcinoma (NPC) was identified among 442 residents of Northern and Southern Taiwan over a 1.5 yr period. Interviews were conducted with 343 of these patients and 1017 nondiseased residents of the same areas. The average annual incidence rate for NPC was 4.2/100,000 population: 5.8 for males; 2.4 for females; 4.5 for Northern Taiwan; 3.8 for Southern Taiwan; 3.2 for the Taiwanese; and 9.9 for the Mainlanders. The age-specific incidence rates rapidly increased in the 30-to-34-yr-old age group, continued to increase gradually until they reached a peak in the 55-59 age group, and declined in the older age groups. Smoking was significantly associated with NPC in that persons smoking more than 20 cigarettes/day stood twice the risk of developing NPC as those who never smoked. Working under poorly ventilated conditions also doubled the risk of NPC. In addition, some nasal symptoms and the use of herb drugs and nasal balms or oils were associated with a higher risk of NPC. The data indicate that the etiology of NPC is probably multifactorial.

- 6277 CARCINOMA OESOPHAGUS IN NORTH KERALA. (E.) Kumar, K. M. (Med. Coll., Calicut, India) and P. Ramachandran. *Indian J Cancer* 10(2):183-187, 1973.

Two hundred consecutive cases of carcinoma of the esophagus occurring in North Kerala, India were studied. Over half of the cases occurred between 41 and 60 yr of age, and the incidence in males was more than four times greater than in females. Nearly 65% of the cases presented a history of eating dried smoked fish; smoked fish; smoking and heavy tea drinking were also prevalent. The symptoms of esophageal carcinoma included dysphagia, regurgitation, retrosternal pain, and inanition. Radiological examination revealed three abnormal patterns: irregular narrowing, filling defect, and obstruction. Esophagoscopy examination revealed proliferative growth in 121 cases, irregular ulceration in 40 cases, narrowing with irregular mucosa in 25 cases, and nodules in 7 cases. Nearly half of the lesions were situated in the lower third of the esophagus. Histologically, the lesion was diagnosed as squamous cell carcinoma in 124 cases, adenocar-

cinoma in 36 cases, mucoid carcinoma in 7 cases, anaplastic carcinoma in 15 cases, and adenoacanthoma in 2 cases.

- 6278 CANCER OF THE UTERINE CERVIX AMONG FILIPINO WOMEN. A TEN-YEAR STUDY AT THE U.P.-P.G.H. MEDICAL CENTER. (E.) Sotto, L. S. J. (U.P.-P.G.H. Med. Ctr., Philippines). *J Philippine Med Assoc* 49(3):139-156, 1973.

Cervical cancer is the most common of all gynecological malignancies among Filipino women. Cervical cancer is found most often among women between 50 and 70 yr of age, those who have married before the age of 20, those who have several children, and low income groups. The initial symptom is usually abnormal vaginal bleeding which is frequently provoked by coitus. The duration of the disease is generally four to six months and the cancer is usually moderately to highly advanced when diagnosis is made. The prognosis is therefore poorer than among the earlier diagnosed cases in the western hemisphere. The presence of moderate to severe anemia contributes further to a poor prognosis, as does the lack of adequate facilities for radiation and organization among physicians. Of 468 patients treated between 1961 and 1969, 32.2% survived for 3 yr; this figure is low by western standards. Survival rates can be increased significantly by earlier diagnosis of the disease; earlier diagnosis can be achieved only by widespread education of the Filipino women. Treatment and follow-up facilities should also be improved and more efficiently organized.

- 6279 LUNG TUMOURS IN ICELAND. (E.) Hallgrims-son, J. (Dept. Path., U. Iceland, Reykjavik). *Acta Pathol Microbiol Scand (A)* 81(6):813-823, 1973.

Two hundred and twenty-three primary lung tumors submitted for histological diagnosis in Iceland during the period 1941-1968 were typed according to the WHO histological classification. The distribution of the four major types was: epidermoid carcinomas, 20.6% (males 26.4%, females 10.1%); small cell anaplastic carcinomas, 37.2% (males 39.6%, females 32.9%); adenocarcinomas 23.3% (males 18.0%, females 32.9%); and large cell carcinomas 14.8% (males 13.2%, females 17.8%). Other types constituted only 4%. The low incidence of epidermoid carcinomas among males and the high incidence of small cell anaplastic carcinomas in both sexes is unusual. The majority of the tumors which could be localized were bronchial or central, and only 12% were peripheral. Based on these histologically verified lung tumors, the male/female ratio decreased from 2.5 to 1.6 over the study period. If two 7 yr periods were compared, the rise in the incidence of lung tumors was statistically significant for the combined tumor types I-IV in both sexes and for adenocarcinomas in females. The ratio of Kreyberg Group I:II has increased for males but remained stationary for females, which throws doubt on the theory that the increase in female incidence can be attributed to smoking. The WHO classification is a practical

guide to the typing of lung tumors in routine diagnostic pathology. The criteria are clear enough for the separation of the major histological types and all subtypes except those of small cell anaplastic carcinomas. The incidence of lung carcinoma in Iceland is expected to continue to rise.

- 6280 DEATHS FROM BRAIN TUMORS IN EASTERN KENTUCKY, 1950-69. (E.) Creagan, E. T. (Natl. Cancer Inst., Bethesda, Md.) and J. F. Fraumeni, Jr. *J Natl Cancer Inst* 51(5):1717-1718, 1973.

Mortality from brain malignancies in a 6-county area of Kentucky which was shown to have an increased frequency of primary intracranial neoplasms was compared to that in the remainder of the state over a period from 1950 through 1969. Among white males in the 6-county area, the ratio of observed to expected deaths from brain tumors for all age groups was significantly high only for the period from 1965 through 1969. The excessive risk was limited to males over the age of 44 years. Among females, there was no significant increase in the risk of brain tumors over any time period. The excess mortality among males primarily reflected the mortality rates of three contiguous counties. Although this cluster of brain tumors could be due to chance, the findings suggest an environmental influence on males. Occupational exposure is suspect, with most of the men surveyed being engaged in soil-contact employment, especially coal mining and farming.

- 6281 PATHOLOGY OF GASTRIC CARCINOMA IN JAPANESE POPULATIONS: COMPARISONS BETWEEN MIYAGI PREFECTURE, JAPAN, AND HAWAII. (E.) Correa, P. (Natl. Cancer Inst., Bethesda, Md.), N. Sasano, G. N. Stemmermann, and W. Haenszel. *J Natl Cancer Inst* 51(5):1449-1459, 1973.

The pathology and related epidemiologic aspects of gastric cancer were studied based on data from 407 surgically excised tumor specimens from Japanese living in Miyagi prefecture in Japan and 256 specimens from Japanese immigrants living in Honolulu, Hawaii. The estimated incidence rates for diffuse carcinomas were similar for both localities, but the corresponding rates for intestinal, mixed, and other (IMO) types were substantially lower for Hawaii. The slopes of the IMO incidence curves were similar in the four subgroups considered (Hawaiian and Japanese males and females), but the curves were displaced horizontally to the right (toward the older age groups) in Hawaii as compared to Japan and in females as compared to males. The slopes of the incidence curves for diffuse carcinomas were less steep than for the IMO types and did not exhibit horizontal displacement. The differences in the slopes and displacement of the type-specific incidence curves can be reconciled with the variation in sex ratios by age observed in the two localities. There was a positive correlation between blood group A and the occurrence of diffuse-type tumors among the Japanese populations. The data indicate

that the diffuse-type and IMO tumors are different entities and that the causative factors involved exert their influence early in life, with migration to a low-risk environment failing to suppress their operation.

- 6282 GROWTH CHARACTERISTICS OF TRANSPLANTED NORMAL BLADDER EPITHELIUM IN FISCHER RATS. I. HISTOLOGY. (E.) Yalciner, S. (U. Massachusetts Med. Sch., Worcester) and G. H. Friedell. *J Natl Cancer Inst* 51(5):1719-1721, 1973.

Bladder tissue fragments from adult male Fischer rats were transplanted by trocar into the s.c. tissue of the flanks of syngeneic hosts. Within 4 days, the bladder transplantations resulted in cyst formation in the recipients. The cysts resulted from the proliferation of the bladder epithelium from the margins of the implant. It spread rapidly over the luminal surface of the needle track, then differentiated into epithelium similar to that lining the normal bladder. Some of the muscle cells in the transplants appeared to have degenerated during the first few days, but smooth muscle persisted in all transplants. By the sixth day, the proliferation of subepithelial capillaries was completed in the transplant, and by the eighth day, the vasculature appeared normal. The connective tissue of the transplant itself appeared almost normal after the fifth day.

- 6283 A NEW METHOD FOR QUANTITATION OF TUMOR GROWTH *IN SITU*: MEASUREMENT BY PLETHYSMOGRAPHY. (E.) Laing, C. A. (Div. Biomed. Sci., Brown U., Providence, R. I.), D. E. Griswold and G. H. Heppner. *J Natl Cancer Inst* 51(4):1345-1348, 1973.

Plethysmography (volumetric measurement by fluid displacement) was used to quantitate changes in tumor volume, *in situ*, with the mouse (BALB/c Crg1 and BALB/c f) mammary tumor as a model system. The technique relied on the ability to propagate tumors subplantarily in susceptible mouse strains. Such tumors retained the histologic features of the original mouse mammary adenocarcinoma and could be serially propagated subplantarily, s.c., and intradermally. The method is precise and convenient for assessing changes in tumor volume without altering the relationship between the tumor and its host.

- 6284 ON THE INCIDENCE OF MALIGNANCY AMONG SCHIZOPHRENIC PATIENTS. (E.) Rassidakis, N. C. (State Mental Hosp., Athens, Greece), M. Kelepouris, K. Goulis and K. Karaiossefidis. *Agressologie* 14(4):269-273, 1973.

Of the 2300 deaths occurring among patients in the State Mental Hospital of Athens between 1953 and 1971, 39 were due to malignant neoplasms. While only 14 of these deaths occurred among schizophrenics, the expected number of deaths among this group would be 38 (based on comparison with the mortality rate from cancer among the general population of Greece).

In particular, the schizophrenic patients seemed to be protected against cancer of the digestive system. No substantial differences were found between the expected and actual number of deaths from cancer among the two other groups of patients dying from malignant neoplasms: alcoholics and drug addicts (7 patients), and those suffering from psychoses other than schizophrenia (18 patients).

- 6285 CANCER MORBIDITY IN NATIONAL-ORIGIN SUBGROUPS OF THE ONTARIO POPULATION. (E.) Cook, D. (Ontario Cancer Treatment Res. Fdn., Canada), E. N. Mackay and D. Hewitt. *Can J Pub Health* 63(2):120-124, 1972.

- 6286 INCIDENCE OF CHILDHOOD LEUKAEMIA. (E.) Waterhouse, J. A. H. (Queen Elizabeth Med. Ctr., Birmingham, England) and J. Powell. *Lancet* (7840):1274, 1973.

- 6287 CARCINOMA OF THE COLON AND RECTUM IN A DEFINED POPULATION. AN EPIDEMIOLOGICAL, CLINICAL AND POSTMORTEM INVESTIGATION OF COLORECTAL CARCINOMA AND COEXISTING BENIGN POLYPS IN MALMO, SWEDEN. (E.) Berge, T. (Malmö Gen. Hosp., Sweden), G. Ekelund, C. Mellner and A. Wenckert. *Acta Chir Scand (Supp)* 438:1-86, 1973.

- 6288 CANCER OF THE CERVIX UTERI IN ARKANSAS. (E.) Felts, S. K. (Field Serv. Br., Public Hlth Serv., Atlanta, Ga.), L. R. Utterback and R. C. Ramsay. *J Arkansas Med Soc* 70(6):206-207, 1973.

See also:

- * (Rev): 6010
- * (Chem): 6047, 6054
- * (Viral): 6198

- 6289 SOME FINDINGS ON MOVEMENT AND CONTACT OF HUMAN NORMAL AND TUMOR CELLS *IN VITRO*. (E.) Projan, A. (Inst. Cancer Res., Acad. Sci. German Democratic Republic, Lindenbergerweg) and St. Tanneberger. *Eur J Cancer* 9(10):703-708, 1973.

To investigate differences in the contact inhibition of movement between normal and tumor cells *in vitro*, cell populations from 17 normal and 29 neoplastic human tissues were studied. The contact phenomena were quantitatively analyzed by means of the nuclear overlapping ratio (O/E). While a number of the tumor cell populations showed O/E values which were comparable with those observed in normal cells, a considerable number of the tumor cell population showed markedly increased values. These differences were statistically significant according to the U-test of Mann and Whitney. The O/E values of the non-neoplastic populations showed a reasonably symmetrical distribution about some central value, whereas the neoplastic cells manifested a great variation and could not be classified according to any known statistic distribution. The differences in contact behavior probably reflect differences in the biophysical properties of the nonneoplastic and normal cells.

- 6290 ATTEMPT TO "ANIMATE" CANCER HISTOLOGY. (Fr.) Gricouff, G. (Curie Fdn., Radium Inst., Paris, France). *Bull Cancer (Paris)* 60(2):213-216, 1973.

A new method is described in which a succession of images of serial sections of a tumor are recorded photographically on 16 mm film in such a way that it appears an imaginary trip is being taken through a tumor. Films made of a squamous cell carcinoma of the cervix are presented which show a cancer lobule surrounded by a red border of peripheral keratinization and a vascular cavity. This is followed by a view of the same cavity which shows a small cancerous mass. By linking together a series of images an illusion of movement is obtained: the budding of an epitheliomatous lobule and its progression and invasion of the cavity can be shown.

- 6291 BEHAVIOR OF INTRAVENOUSLY INJECTED MALIGNANT LYMPHOMA CELLS. A MORPHOLOGIC STUDY. (E.) Dingemans, K. P. (Lab. Path. Anatomy, Wilhelmina Gasthuis, Amsterdam, The Netherlands). *J Natl Cancer Inst* 51(6):1883-1895, 1973.

Malignant lymphoma cells of different types were injected i.v. into intact, isologous two to three month old male and female mice. Cells designated as lymphosarcoma cells were trapped initially in the lungs or the liver after injection into a tail vein and a mesenteric vein, respectively. A few days later, however, they were distributed evenly over both the lungs and the liver, regardless of the site of injection. Within eight days, all animals had died with greatly enlarged livers and spleens and massive numbers of tumor cells in the lungs. Cells designated as lymphocytic leukemia

cells formed sharply demarcated, spherical nodules in virtually every organ investigated, regardless of the site of injection. Only in the lungs were they confined to the capillaries. Despite these differences, the interaction of the cells with the surrounding lung or liver tissue was identical for both types of tumors. In the lung capillaries, the endothelium was never injured; but, in the liver, the tumor cells quickly penetrated the sinusoidal wall by fragmentation of the endothelium over large areas, without the formation of pseudopods. However, after the extravasation, pseudopods were extended into adjacent hepatocytes. The hepatocytes were often greatly distorted by the tumor cells, but they never seemed to be obliterated; the bile canaliculi always remained intact. Although the Kupffer cells were initially in close contact with the tumor cells, no phagocytosis or any other signs of activation of the Kupffer cells developed.

- 6292 A COMPARATIVE AUTORADIOGRAPHIC INVESTIGATION OF CELL PROLIFERATION IN A PARTLY DIFFERENTIATED AND AN ANAPLASTIC TRANSPLANTABLE MAMMARY CARCINOMA OF MICE. (E.) Feaux de Lacroix, W. (Path. Inst. U. Cologne, Germany), P. J. Klein, H. O. Klein and K. J. Lennartz. *Beitr Pathol* 150(3):287-297, 1973.

Cell proliferation in differentiated HB mouse mammary carcinomas and anaplastic mammary carcinomas derived from the spontaneous breast tumor of a C3H mouse was examined autoradiographically. HB mammary carcinomas transplanted onto C3H mice showed an adenoid pattern with solid alveolar areas and squamous metaplasia with keratinization. Anaplastic carcinomas transplanted onto NMRI mice exhibited a diffuse infiltrating growth with pronounced cellular pleomorphism and a tendency to necrosis. The autoradiographs showed diffuse labeling of the anaplastic carcinoma, particularly in the marginal zone; the partly differentiated carcinoma showed a more spotted labeling in areas looking like proliferating centers. The first labeled mitoses of the HB mammary carcinoma were visible 1 hr after a single injection of ³H-thymidine; essentially all mitoses were labeled after 4 hr. The minimal general time was 13 hr and the most frequent generation time was 15.5 hr. The minimal generation time for the anaplastic mammary carcinoma was 15 hr, with the most frequent generation time being about 16 hr. The approximate value of the growth fraction following repeated injections of ³H-thymidine was about 55% for the mammary carcinoma HB and 50% for the anaplastic mammary carcinoma. Thus, the two carcinomas showed no significant differences in the generation cycle and the growth fraction.

- 6293 CULTIVATION AND CHARACTERIZATION OF BALB/cfc3H MAMMARY TUMOR CELL LINES. (E.) Yagi, M. J. (Cancer Res. Lab., U. California, Berkeley). *J Natl Cancer Inst* 51(6):1849-1860, 1973.

Cell lines and sublines initiated from BALB/cfc3H

mammary adenocarcinomas exhibited varying morphologies during the 15- to 21-month culture periods. Two epithelial cell lines, FUKU and MJY, continued to form the hemicysts and mounds characteristic of primary cell cultures. Subline MJY-alpha did not form these structures. Instead, the cells varied from polygonal to fusiform within each passage level and, when confluent, the monolayers continually released viable cells into the culture fluid. When introduced into isogenic hosts, FUKU rapidly established adenocarcinomas with acinar areas, though MJY-alpha yielded only slow-growing carcinosarcomas. ³H-uridine incorporation revealed the constant release of virions from the cell lines and subline. Immunodiffusion assays of virus purified from the culture fluids indicated that FUKU released a mixture of virions containing both mammary tumor virus (MTV) and murine leukemia virus (MuLV) antigens; MJY-alpha virions, on the other hand, were positive for only MTV antigens. Electron microscopic examination of the cell lines and purified virions substantiated this finding. Immunofluorescence detected a shift in the localization of MTV antigens in fixed cell layers of long-term cultures. With increasing passage levels, the cytoplasmic fluorescence typical of primary cultures was replaced by a cell membrane-associated staining pattern. By the fourth to sixth passage level, only cell-surface fluorescence was observed with use of anti-MTV antisera.

- 6294 CHARACTERIZATION OF NUCLEAR RNP PARTICLES FROM HeLa CELLS. ANALYSIS OF PROTEIN AND RNA CONSTITUENTS. PRESENCE OF POLY(A). (E.) Ducamp, C. (Saint-Eloi Hosp., Montpellier, France) and P. Jeanteur. *Biochimie* 55(10):1235-1243, 1973.

Ribonucleoprotein particles (RNP) derived from HeLa cell nuclei were found to have primary sedimentation coefficients around 30 to 40S (monoparticles). Much larger structures with sedimentation coefficients up to 200S were occasionally observed (polyparticles). The RNP particles had a characteristic low density in CsCl (1.39 to 1.41 g/cu cm) and their RNA moiety exhibited the high A-U content and the absence of pseudouridylic acid characteristic of HnRNA. Poly(A) was demonstrated in the RNA extracted from the particles. SDS acrylamide gel electrophoresis of the particle proteins revealed a complex pattern with sizes ranging from 35,000 to 150,000 daltons. Thus, the data do not support the existence of a unique "informoer" protein of 40,000 daltons.

- 6295 HISTOLOGIC VARIATION AMONG POORLY DIFFERENTIATED INVASIVE CARCINOMAS OF THE HUMAN UTERINE CERVIX. (E.) Auersperg, N. (Cancer Res. Ctr., U. British Columbia, Vancouver, Canada), H. Erber and A. Worth. *J Natl Cancer Inst* 51(5):1461-1477, 1973.

Patterns of growth and invasion were correlated with ultrastructural evidence of squamous, basal, or glandular differentiation in 17 human cervical carcinomas classified as poorly differentiated by histopathologic criteria. Traits of the spinous stage of differentiation (e.g., tonofibrils, glyco-

gen, desmosomes) were retained predominantly by tumors that grew as compact, expanding masses, showed central necrosis, and elicited leukocytic responses; traits of basal or glandular differentiation (e.g., basement membranes, secretory activity) were retained predominantly by carcinomas characterized by diffuse invasion, extensive associations with connective tissues, and vascularization. Only one carcinoma lacked all ultrastructural evidence of differentiation, while spinous and glandular characteristics coexisted in cells of some tumors. Secretory activity, deposition of extracellular materials, and the accumulation of cortical cytofilaments by cancer cells at the interface with connective tissues seemed to be interrelated processes and possibly associated with invasiveness. Fibrillar nuclear inclusions were found in 13 tumors. The results indicate that traits of differentiation, retained to a fragmentary degree not immediately obvious histologically, may greatly influence the growth pattern of apparently undifferentiated carcinomas, and that definite correlations exist between some common histopathologic characteristics of these tumors and specific retained normal cell properties.

- 6296 'HYPERCOAGULABLE STATE' IN CHILDREN WITH ACUTE LEUKEMIA OR DISSEMINATED SOLID TUMORS. (E.) Pochedly, C. (Nassau County Med. Ctr., East Meadow, N.Y.), S. P. Miller and A. Mehta. *Oncology* 28(6):517-522, 1973.

Coagulation factors were assayed in 12 children with acute lymphoblastic leukemia and in six children with disseminated solid tumors. The blood of 11 of these cases showed increased levels of fibrinogen, and the partial thromboplastin time was shorter than normal in seven cases of acute leukemia and 3 cases of disseminated solid tumors. Factor V showed no significant deviations, factors VII and X were increased in 1 out of 8 cases, and the levels of factors VIII, IX, and XI were significantly increased in the majority of cases. Follow-up assays in seven children with acute leukemia revealed that the initial or pretreatment levels of factor VIII were slightly to markedly elevated in all cases; following complete remission, the factor VIII levels were either normal or slightly subnormal. One child with persistently elevated factor VIII levels showed early CNS relapse. Increased levels of factor VIII and other coagulation factors may often be sensitive parameters of leukemia or cancer activity.

- 6297 TUMOUR CELL-TUMOUR CELL EMPERIOPOLEIS STUDIED BY TRANSMISSION ELECTRON MICROSCOPY. (E.) Chemnitz, J. (Dept. Anat., U. Odense, Aarhus, Denmark) and P. Bichel. *Exp Cell Res* 82(2):319-324, 1973.

Ascites tumor cells from a hypotetraploid plasmacytoma JB-1 maintained in AK mice were examined using transmission electron microscopes. Examination of a 7-day-old JB-1 ascites tumor revealed a cell inside what appeared to be a vacuole inside another JB-1 cell. The cytoplasm of the inner cell was

separated from the cytoplasm of the "host" cells by two membranes, which maintained close contact via various projections or pseudopodia. The shape and size of the inner cell were similar to those of most normal JB-1 cells, while the host cell had a diameter of 16 to 20 μ m and a flattened and excentric nucleus. Among 40 specimens representing various ages of the tumor (second to thirteenth day), only one showed such evidence of emperipolesis.

- 6298 NONMALIGNANCY OF HYBRIDS DERIVED FROM TWO MOUSE MALIGNANT CELLS. I. HYBRIDS BETWEEN L1210 LEUKEMIA CELLS AND MALIGNANT L CELLS. (E.) Jami, J. (Inst. Sci. Cancer Res., Villejuif, France) and E. Ritz. *J Natl Cancer Inst* 51(5):1647-1653, 1973.

LM(TK-)C1 1D cells (derived from a C3H mouse), L1210-R cells (derived from a DBA/2 mouse) and hybrids of these two lines were cultured and inoculated into groups of C3H, DBA/2, and (DBA/2 X C3H)F1 (D2C3F1) mice. The L1210-R cells produced tumors and death in 87 of 88 DBA/2 mice and proved to be equally lethal in D2C3F1 mice. The C1 1D cells produced tumors in 10 of the 59 inoculated C3H mice into which they were injected. Four independent hybrid cell clones derived from the two parent cell lines failed to induce tumors in compatible D2C3F1 mice, although all four lines had the *in vitro* characteristics of malignant cell populations. Tumors did develop in 13 of 15 D2C3F1 mice injected with a mixture of C1 1D and L1210-R cells; cultures of the tumor cells contained L1210-R cells, with half of the cultures also containing C1 1D cells. The data suggest that malignancy was suppressed in the hybrid cells by complementation.

- 6299 PROGRESSIVE ENZYME STUDIES ON SPONTANEOUS HEPATOCARCINOGENESIS IN RECIPROCAL F_1 CROSSES OF C_3H (JAX) AND ICRC STRAINS. (E.) Gupte, N. V. (Cancer Res. Inst., Bombay, India) and S. V. Bhide. *Indian J Cancer* 10(2):161-166, 1973.

The activities of RNAase, DNAase, aspartic transcarbamylase, xanthine oxidase, glucose-6-phosphatase, and fructose-1,6 diphosphatase were measured in the normal liver tissue and hepatoma tissue of F_1 crosses between C_3H (JAX) and ICRC mice. Among the male progeny, the activities of RNAase and DNAase decreased significantly at the age of 16 months, at which time marked hyperplasia was observed in the liver tissue. The activities of these enzymes in the female progeny increased at this age. The activities of aspartic transcarbamylase and xanthine oxidase increased progressively from the age of 10 months in the male progeny; the enzyme activity was greatest in the tumor tissue and was higher in the progeny resulting from crosses between C_3H females and ICRC males than in the progeny resulting from crosses between ICRC females and C_3H males. The activities of aspartic transcarbamylase and xanthine oxidase did not change in the female progeny. In the male progeny, the activities of glucose-6-phosphatase and fructose-1,6 diphosphatase decreased with age, being lowest in the tumor tissue; the activities of these enzymes in

the female progeny did not change. The incidence of hepatoma was lower in the female progeny than in the male progeny.

- 6300 SPIN ECHO NUCLEAR MAGNETIC RESONANCE IN CANCEROUS TISSUE. (E.) Iijima, N. (St. Marianna U., Sch. Med., Kawasaki Kanagawa-ken, Japan), S. Saitoo, Y. Yoshida, N. Fujii, T. Koike, K. Osanai and K. Hirose. *Physiol Chem Phys* 5:431-435, 1973.

The magnetic relaxation time in normal organs from tumor-bearing C3H/He/jms mice were determined using Spin Echo Nuclear Magnetic Resonance (NMR). Solid MH134 tumor cells were transplanted s.c. into the mice 10 days prior to NMR analysis. A considerable increase in the relaxation time (T1, T2) was observed for almost all of the established MH134 solid tumors relative to normal tissues except in the case of the brain and lymph node. The values of T2 in a malignant liver tumor were about twice those found with normal liver tissue. To investigate the relationship between relaxation time and tumor growth, acetylaminofluorescein-induced hepatomas in rats were studied. The value of T2 in the liver cell carcinoma was higher than that in the adenoma and in the normal tissue. There was no significant increase in T2 in regenerating liver tissue as compared with normal liver tissue. These data may indicate an important role of the physical change in the water of neoplastic tissue.

- 6301 CULTURING HUMAN BREAST TUMORS. (E.) Bishum, N. (Marie Curie Mem. Fdn., Surrey, England), J. Mills, D. C. Williams and R. W. Raven. *Cytologia* 38(4):651-656, 1973.

Tumor specimens from 12 patients undergoing surgery for carcinoma of the breast were cultured in media containing a variety of constituents and, in some cases, estradiol and/or progesterone. Minimal growth of fibroblastic cells was obtained using the basic medium of fetal calf serum and M.E.M. or T.C. 199. However, epithelial cells were seen in appreciable numbers only in cultures containing estrogen, progesterone, or bovine amniotic fluid, which is reputedly high in certain hormones. Several of the cultures were kept alive and proliferating for at least 5 wk, and the cells have been successfully passaged beyond the fifth subculture. Although no permanent cell lines have yet been established, enough cells have been produced using these techniques to allow cytochemical, biochemical, and immunological studies to be undertaken. Trypsinized cells derived from the original 12 breast tumors failed to grow in culture.

- 6302 ESTABLISHMENT OF TWO INBRED STRAINS OF THE RAT FOR CANCER RESEARCH IN TISSUE CULTURE. (E.) Takaoka, T. (Inst. Med. Sci., U. Tokyo, Japan) and H. Katsuta. *Japan J Exp Med* 43(5):403-411, 1973.

Two strains of Japanese Albino Rats, JAR-1 and JAR-2, were established to aid in the study of transplantable

ascites hepatomas. The JAR-1 rats are highly susceptible to ascites hepatomas AH-130, AH-13, AH-7974, Yoshida sarcoma, and Takeda sarcoma; the JAR-2 strain is susceptible to the AH-130 tumor cell strain. Skin grafts from syngeneic JAR-1 rats survived until the deaths of the hosts, as did grafts from female JAR-2 donors to male recipients. Some signs of chronic rejection were noted when grafts from male JAR-2 donors were received by JAR-2 females; these results may suggest some histocompatibility antigens linked with Y chromosomes in this strain. Minute arms were found on the third chromosomes of cultured cells derived from JAR-1 rats, but they were not found in subsequent generations of JAR-1 cells.

- 6303 MEASUREMENT OF THE RATE OF CELL LOSS DURING TUMOR GROWTH WITH LABELED IODODEOXYURIDINE. (E.) Okumura, Y. (Aichi Cancer Res. Inst., Nagoya, Japan), S. Yamada, S. Nishio, T. Morita and T. Matsuzawa. *Cann* 64:499-501, 1973.

Cells of a mammary carcinoma maintained in the peritoneal cavity of female C3H/He mice by serial transplantation were labeled with 5-iododeoxyuridine ($0.2 \mu\text{Ci } ^{125}\text{IUdR}/\text{mouse}$) before intracutaneous injection in the flank of syngeneic mice. The rate of tumor growth after transplantation of 10^6 cells decreased with increasing tumor size. Volume doubling time was about 1 day for a small tumor (less than 10^2 mm^3) and about 4 days for a large tumor (larger than 5×10^2). Cell loss rates, estimated from decrease in radioactivity, were 0.008 and 0.004/hr for the small and large tumor, resp. After 14 days tumor-bearing mice were injected i.p. and i.v. with $0.2 \mu\text{Ci } ^{125}\text{IUdR}$ for determination of total radioactivity in tumor and organs. Activity was high in the intestine, spleen, and tumor. No difference in distribution was found between the two routes of administration.

- 6304 CYTOCHEMICAL STUDIES OF ALKALINE PHOSPHATASE IN EXFOLIATED CELLS IN NORMAL AND CANCER CERVIX. (E.) Chowdhury, T. R. (Chittaranjan Natl. Cancer Res. Ctr., Calcutta, India), S. Bose, S. Guhathakurta and J. R. Chowdhury. *Indian J Cancer* 10(2):155-160, 1973.

Vaginal smears from pre- and post-menopausal women with cervical cancer were compared cytochemically with smears from normal controls; the differential effects of the chloride salts of sodium, potassium, lithium, manganese, nickel, and iron on the activity of alkaline phosphatase were determined. All of the cations studied except K^+ had an inhibiting effect on alkaline phosphatase in the exfoliated cells from the pre-menopausal cancer patients. In contrast, the same cations activated or had no effect on the enzyme activity in the cells from the pre-menopausal controls. In the absence of Mg^{++} , most of the cations had no effect on the activity of alkaline phosphatase in the cells from controls or cervical cancer patients; in both groups, Fe^{+++} had an inhibiting effect, while Ni^{++} had an inhibiting effect on the cells from the cancer group. The activity of alkaline phosphatase was either enhanced

or unaffected by the different ions in the cells from the post-menopausal controls; it was inhibited or unaffected in the cells from the post-menopausal cancer patients. In the absence of Mg^{++} , no inhibition was observed in the cells from the cancer patients and some ions had an activating effect. In the presence of Mg^{++} , both Fe^{+++} and Na^+ had inhibiting effects in the cancer group, but activating or no effects in the normal group. Na^+ in the presence of Mg^{++} and Fe^{+++} in the absence of Mg^{++} also had differential effects on pre- and post-menopausal cells, regardless of the presence or absence of cancer.

- 6305 RNA SYNTHESIS IN SARCOMATOUS OR LEUKEMIC LYMPHOCYTES (CYTOAUTORADIOGRAPHIC INVESTIGATIONS). (E.) Micu, D. ("N. Gh. Lupu" Inst. Internal Med., Bucharest, Rumania), E. Mihailescu and N. Raiciulescu. *Rev Roum Med Intern* 10(3):189-192, 1973.

Cytoautoradiography with tritiated uridine was used to study the rate of RNA synthesis in the blood lymphocytes of 15 patients with lymphosarcoma (LS), 34 patients with chronic lymphocytic leukemia (CLL), and 20 normal subjects. Both the mean index of labelling and the labelling intensity were higher in the LS patients (63.5 ± 2.5 ; 86.6 ± 2.4) than in the CLL patients (54.6 ± 3.6 ; 64.3 ± 3.8) and the normal controls (17.7 ± 2.7 ; 18.4 ± 0.4). The accelerated rate of RNA synthesis in the lymphosarcomatous cells is taken as a sign of hyper-RNA synthesis and high metabolic activity in these cells. The detection of a high proportion of lymphocytes with increased rates of RNA synthesis might provide an indication of the extent of the sarcomatous process in the lymphoid organs; it might also indicate the presence of a lymphocytic population involved in the malignant process as opposed to the normal lymphocytic population.

- 6306 PRESENCE OF HEPATOCYTE-SPECIFIC MITOTIC INHIBITOR IN NORMAL RAT PLASMA. (E.) Onda, H. (Faculty Med., U. Tokyo, Japan) and J. Yoshikawa. *Cann* 64(2):139-149, 1973.

Male Wistar rats were subjected to partial hepatectomy and killed at various intervals thereafter. The mitotic index began to increase 18-24 hr after partial hepatectomy and reached a peak after 30 hr; DNA synthesis in the hepatocytes began to increase less than 18 hr after partial hepatectomy and reached a maximum 24 hr after the operation. The concentrations of total protein, albumin, and γ -globulin in the plasma of the partially hepatectomized animals fell slowly, while the concentrations of α_1 -, α_2 -, and β -globulins fell rapidly. The concentration of α_1 -globulin appeared to correlate closely with the occurrence and suppression of mitosis in the hepatocytes, indicating that it might be a humoral inhibitor. In a second experiment, partially hepatectomized rats were injected i.p. with physiological saline or solutions of the various plasma protein components. The P-2 fraction (consisting largely of albumin) appeared to have little effect on the occurrence or suppression of mitosis

in the hepatocytes. The P-3 fraction (28% albumin, 52% α_1 -globulin, and 20% β -globulin) had a mitosis-delaying effect. The mitosis-delaying effect was lost by heating the P-3 fraction at 65 C for 30 min. The F fraction (consisting only of α_1 -globulin) and S fraction (consisting only of β -globulin) each had significant mitosis-delaying effects. Thus, the humoral inhibitor or hepatocyte-specific mitotic inhibitor may be present in the α_1 -globulin fraction and may be a heat-labile, high molecular wt entity.

- 6307 PILOMATRIXOMA (EPITHELIOMA CALCIFICANS MALHERBE): A CLINICAL AND HISTOPATHOLOGICAL SURVEY OF DANISH MATERIAL FROM 1954 TO 1971. (E.) Kleener, J. (Eye Pathol. Inst., U. Copenhagen, Denmark). *Acta Ophthalmol (Kbh)* 51:692-699, 1973.

Nineteen cases of pilomatrixoma (epithelioma calcificans Malherbe) were examined clinically and histopathologically. In 2/3 of the cases, the lesion occurred before the age of 20 yr, and it was more prevalent among females (11 cases) than among males (7 cases). The tumor was situated above the palpebral fissure in 13 cases and beneath it in five cases. The lesion was typically described as a solid tumor adherent to the skin but not to the underlying tissues. Histologically, the tumor was composed of epithelial strands and islands of characteristic "shadow cells." The stroma was characterized by granulation tissue with foreign body giant cells. Ninety-five percent of the lesions showed calcification and the tumors were characteristically benign. The diagnosis of pilomatrixoma was made retrospectively on histological grounds; it was not made clinically in any of the cases herein reviewed.

- 6308 THREE CASES OF CONGENITAL LEUKAEMIA. (E.) Zanetti, P. ("Ugo Frizzoni" Inst., Bergamo, Italy) and G. Castelli. *Parminerva Med* 15(1-2):12-17, 1973.

One case of congenital myeloid leukemia and two cases of congenital lymphoid leukemia are reported. In two instances, the first signs of congenital leukemia were noted on the first day of life, and the disease originated prior to the 20th day in the third case. The course of the disease was particularly malignant in all three cases and none showed complete remission. Survival times from frank onset were 27 days, 23 days, and 5 months. One case showed a long period of latency between the first signs of disease and its acute onset, while another case showed the unusual presence of a meningeal site which proved susceptible to treatment.

- 6309 POLYACRYLAMIDE: AN IMPROVED SURFACE FOR CLONING OF PRIMARY TUMORS CONTAINING FIBROBLASTS. (E.) Jones, T. L. (Dept. Path., Queen's U., Kingston, Ontario, Canada) and J. S. Haskill. *J Natl Cancer Inst* 51(5):1575-1580, 1973.

Polyacrylamide dishes were used as the primary culture vessels for culturing a variety of solid and

ascites tumors. These dishes allowed for the growth of tumor cells while inhibiting the proliferation of fibroblasts. In addition, as compared with the petri dish, the acrylamide surface may provide a more suitable growth environment for certain varieties of tumor cells. Tumor cells did not spread out on the acrylamide surface and were seldom attached, but often grew in suspension. Four morphologic types were observed in the cultured tumor lines: type A was represented by P815 mastocytoma, while types B, C, and D were represented by the T1699, CaD₂, and CaD₁ mammary adenocarcinomas. In tumors analyzed for chromosomes, the karyotypes were abnormal, and in all cases markers were present to verify that the cells were tumor cells. Although the tumor cells grew rapidly in the acrylamide dishes, some alteration in their immunogenic properties was apparent: the cultured lines remained antigenic.

- 6310 SPIN-LATTICE RELAXATION TIME OF THE PROTONS IN CELL WATER IN NORMAL AND TUMOR TISSUE IN MAN. (Ger.) Schmidt, K. (Surg. Inst., U. Tubingen, Germany), E. Breitmaier, B. Aeikens, K. H. Zeiger and B. Knüttel. *Z Krebsforsch* 80(3):209-222, 1973.

The spin-lattice relaxation time (T_1) of protons in cell water was measured in human tumor tissue from the lungs, liver, stomach, breast, thyroid, uterus and ovary and was compared with values obtained on normal tissue from these organs. Larger values for T_1 were found in tumor tissue (0.8-1.3 sec) than in normal tissue (0.3-0.6 sec). Large variations in T_1 values found in both normal and tumor tissue from the ovaries and uterus may be caused by changes in cell metabolism which occur during the menstrual cycle. These findings are similar to those previously reported in experimental animals and suggest that the structure of cell water differs in normal and tumor tissue because of the lower degree of organization in tumor cells.

- 6311 FAMILIAL POLYPOSIS, DIFFUSE POLYPOSIS AND CANCER. (Fr.) Vecerina, S. (Dept. Surg. A, U. Lausanne, Switzerland), J. -V. Fitting, F. Saegesser and J. Pettavel. *Praxis* 62(34):1036-1040, 1973.

Reports are presented for a patient with Peutz-Jegher's syndrome and for three families with familial polyposis and/or cancer. Two of the patients with familial polyposis later developed cancer. At rectosigmoidoscopy, a 31-yr-old man had around 20 polyps in the rectal ampulla and the lower sigmoid and a carcinoma at the rectosigmoid junction. Peritoneal metastases were found at laparotomy. The patient's father and one of his three daughters had cancer and one of his brothers had polyposis. A 51-yr-old man underwent total proctocolectomy for several thousand adenomatous polyps; he is in good health 12 yr after surgery. The patient's father had cancer and one of his five children has complete Gardner's syndrome; another child has polyposis. A 31-yr-old man with a sigmoid adenocarcinoma was found to have several adenomatous polyps at surgery.

One yr later, the patient underwent resection of the transverse colon for one of these polyps which had become malignant. The patient died two yr after the second operation with hepatic metastases and a desmoid tumor of the abdominal wall. Of this patient's nine brothers and sisters, five had either polyposis or cancer. Because of a tendency to undergo malignant transformation, radical surgery is recommended for patients with familial polyposis. A 12-yr-old boy with Peutz-Jegher's syndrome underwent resection of the small intestine for ileus caused by polyps. Another resection of the small intestine was performed 5 yr later to remove an adenocarcinoma in the distal ileum. The patient died 11 yr later at age 28 with disseminated metastases.

6312 PLASMA OESTRADIOL AND PROGESTERONE IN BENIGN BREAST DISEASE. (E.) Swain, M. C. (Imperial Cancer Res. Fund, London, England), J. L. Hayward and R. D. Bulbrook. *Eur J Cancer* 9(8):553-556, 1973.

The concentrations of plasma estradiol and progesterone were measured in the blood of women with benign breast disease and in a control group of ostensibly normal women. There were no significant differences in the steroid levels of the two groups in the follicular, ovulatory and luteal phases of the menstrual cycle. The hormone levels were not related to any of the histological diagnoses made on tissue obtained at biopsy from the women with benign breast disease. Several other studies of the preclinical and clinical phases of benign breast disease are cited which also suggest that although the concept of estradiol as a putative breast carcinogen has been clearly demonstrated in rodents, it appears less tenable in man.

6313 LYMPHOCYTIC AND PLASMACYTIC REACTIONS IN SOLID TUMORS. (E.) Stacher, A. (Hanusch Hosp., Vienna, Austria), J. Böhm and P. Höcker. *Rev Roum Med Intern* 10(3):165-169, 1973.

Twenty-five cases involving chronic lymphocytic leukemia or lymphocytic reaction along with solid tumors were observed. In all patients cytological and histological investigations led to the diagnosis of chronic lymphocytic leukemia. In some patients a highly malignant solid tumor was detected some months after the diagnosis of leukemia. In another group of patients, a spontaneous remission of the leukemia occurred without therapy, at which time cancer was detected. In a third group of patients, the clinical symptoms of chronic lymphocytic leukemia appeared some years after the extirpation of a solid tumor; some months later, a spontaneous remission of the leukemia occurred as metastases of the original tumor were detected. In the last two groups of patients, the apparent leukemias were found to be lymphocytic reactions instead. If a lymphocytic reaction occurs before the clinical appearance of a malignant tumor or before the tumor metastasizes, it must represent the last attempt of the patient's immune mechanisms to prevent the growth of the tumor.

Two cases involving the occurrence of plasmacytic bone marrow reactions in conjunction with malignant tumors were also observed. In these cases there was no increase in flaming plasma cells in bone marrow smears, but in both there was a clear paraproteinemia. In both cases, the same organs were affected by the tumors as in the cases involving lymphocytic reactions. It appears that the plasmacytic reactions also express the last attempt of the organism to slow down the growth of a tumor.

6314 SERUM PROTEINS OF PATIENTS WITH BENIGN HYPERPLASTIC AND MALIGNANT PROSTATE. (E.) Dhar, N. K. (King George Med. Coll., Lucknow, India), P. C. Dube, A. R. Chowdhury and A. B. Kar. *Indian J Cancer* 10(2):188-190, 1973.

The serum proteins of patients with benign prostatic hyperplasia or advanced carcinoma of the prostate were studied by paper electrophoresis and the results compared with those from normal controls. Five typical protein fractions - albumin and α_1 , α_2 , β , and γ -globulins - were found in the control sera; in the sera of the patients with benign hyperplasia, the concentrations of these fractions were increased. These fractions were also elevated in the prostatic cancer patients, whose sera contained two additional fractions, M_1 and M_2 . The two new fractions migrated ahead of the five typical fractions. It appears unlikely that any zinc-binding protein in prostatic cancer is of serum origin.

6315 COMPARATIVE STUDY OF PROTEIN BIOSYNTHESIS IN MICE SUSCEPTIBLE AND RESISTANT TO BREAST CANCER. (E.) Sheth, N. A. (Cancer Res. Inst., Tata Memorial Ctr., Parel, Bombay, India) and S. V. Bhide. *J Natl Cancer Inst* 51(6):1977-1979, 1973.

Sequential studies on rates of protein biosynthesis in breast, liver, and tumor tissues of breast cancer susceptible C3H/J mice were compared to those on protein biosynthesis in breast and liver tissues of resistant C57BL mice corresponding in age. In the C3H/J strain, the rate of incorporation of ^{14}C -leucine into proteins of breast and liver tissues increased with age and was highest in the mammary tumor, but did not differ significantly from the rate in mammary tissue of pregnant mice. The breast tissue of the C3H/J strain was more sensitive to hormonal variations than that of the resistant C57BL strain.

6316 STEROID BIOSYNTHESIS BY TRANSPLANTABLE GONADAL TUMORS OF RAT. (E.) Van Houtte, I. (Inst. Biol. Exp. Med., Buenos Aires, Argentina), R. Iglesias, O. Irusta and G. F. Wassermann. *J Steroid Biochem* 4(5):503-508, 1973.

Ovarian granulosa cell tumors and testicular tumors grown in AxC rats were incubated *in vitro* with $(1-^{14}\text{C})$ -sodium acetate, $(1-2^3\text{H})$ -cholesterol, $(4-^{14}\text{C})$ -pregnenolone, $(7-^3\text{H})$ -progesterone, $(1-2^3\text{H})$ -androstenedione, or $(1-2^3\text{H})$ -testosterone. Some samples were also incubated with LH or dibutyryl 3'5' cyclic AMP. In

the ovarian tumor samples, pregnenolone was actively converted to progesterone and incubation with acetate produced trace amounts of progesterone. This reaction was not modified by LH or cAMP. Testosterone was actively transformed to 17 β -estradiol, and androstenedione converted preferentially to estrone. Cholesterol was converted to unidentified compounds, and progesterone was converted to unidentified compounds and small amounts of 20 β -dihydroprogesterone. The 17 hydroxylation of pregnenolone or progesterone was not observed. The testicular tumor samples showed an androgenic and estrogenic activity in biological tests in inoculated animals; they failed to convert the substrates used to any of the steroids investigated.

- 6317 PROLACTIN: RADIOIMMUNOLOGICAL DETERMINATION OF BASAL ACTIVITIES AND CHANGES CAUSED BY ETHINYLESTRADIOL AND NAFODINE IN ADVANCED BREAST CANCER IN WOMEN. (Fr.) Gorins, A. (Necker Hosp., Paris, France), A. Netter and M. L'Hermite. *Ann Endocrinol (Paris)* 34(5):601-602, 1973.

Radioimmunoassays were performed to determine plasma prolactin activities in 19 patients with advanced breast cancer before and during hormone therapy. No significant differences were found in prolactin activities in normal subjects and in untreated women with breast cancer. Normal values ranged from 0 to 350 mIU, while in breast cancer patients before hormone therapy plasma prolactin activities ranged from 30 to 585 mIU (mean: 263 mIU). Administration of ethinylestradiol (3 mg/day) increased prolactin activity to a mean of 806 mIU, while nafodine (180 mg/day) had a variable effect on prolactin activities; the mean value was 352 mIU. There appeared to be no correlation between the clinical course of the disease and changes in prolactin activity.

- 6318 NEOPROTEOLIPIDS IN MALIGNANT TUMORS. (E.) Skipski, V. P. (Sloan-Kettering Inst. Cancer Res., Rye, N.Y.), F. M. Archibald, C. R. Adler, M. Barclay, G. S. Tarnowski and C. C. Stock. *Proc Am Assoc Cancer Res* 14(March):43, 1973.

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- 6321 THE PRESENCE OF PROLIFERATIVE AND NON-PROLIFERATIVE ACTIVITIES IN URINARY COLONY STIMULATING FACTOR (CSF) FROM LEUKEMIC PATIENTS. (E.) Kinkade, J. M., Jr. (Emory U., Atlanta, Ga.), D. P. Groth, E. S. Mingioli and D. S. LaVia. *Proc Am Assoc Cancer Res* 14(March):43, 1973.

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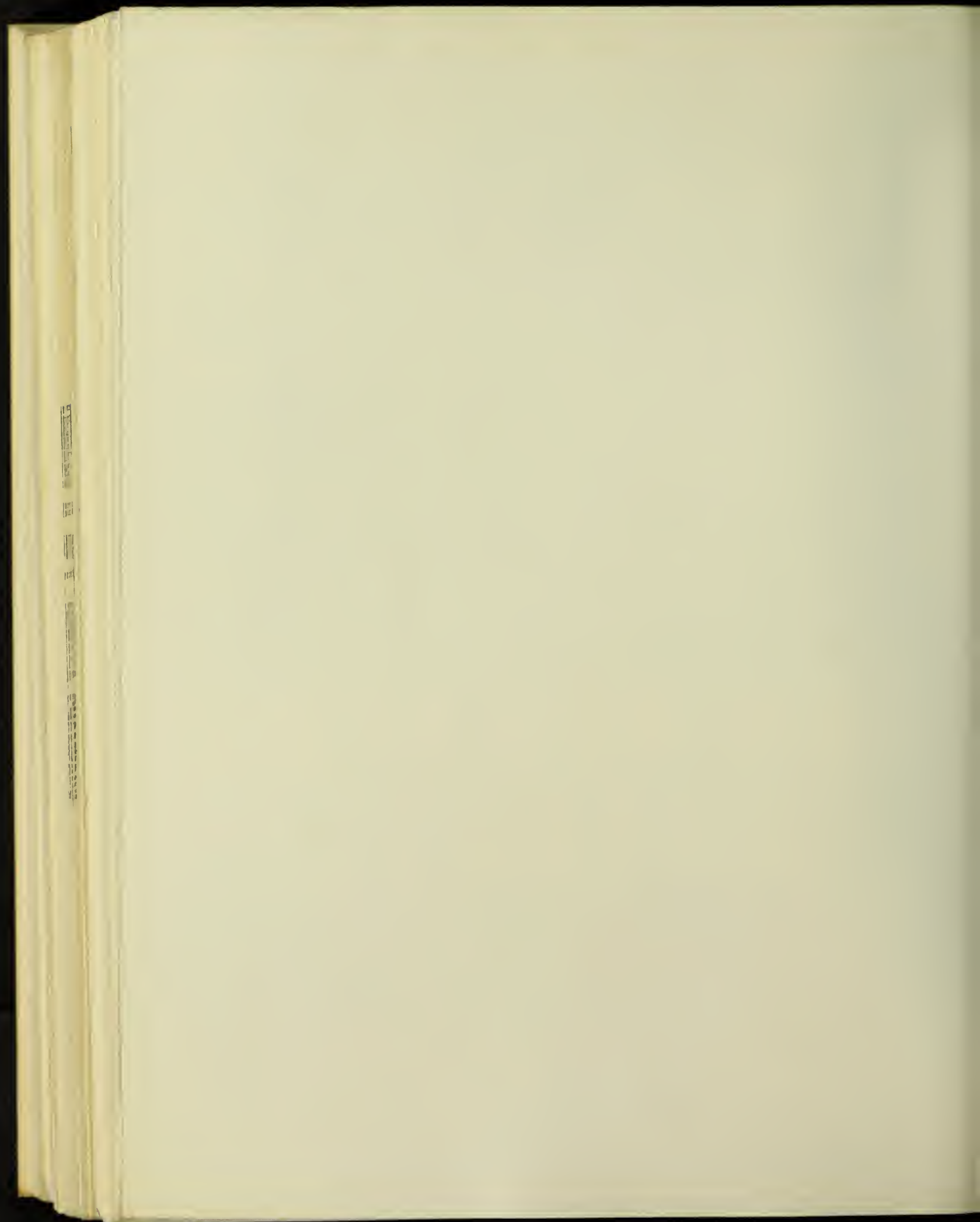
Abstract & Citation Nos. 6601-7200

**Vol. 11
No. 12**

CARCINOGENESIS ABSTRACTS

National Cancer Institute

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service National Institutes of Health



CARCINOGENESIS ABSTRACTS

A monthly publication of the
National Cancer Institute

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Literature Selected, Abstracted, and Indexed
by

The Franklin Institute Research Laboratories
Science Information Services
Biomedical Section

Bruce H. Kleinstein, Ph.D., Technical Editor

Contract Number N01 CP 33309

Public Health Service, USDHEW

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For journals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical Periodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
ln.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotrophic hormone	mg	milligram(s)
ADP	adenosine diphosphate	min	minute(s)
AMP	adenosine monophosphate	ml	milliliter(s)
ATP	adenosine triphosphate	mm	millimeter(s)
C	degrees centigrade	MTD	maximum tolerated dose
cm	centimeter(s)	ng	nanogram (10^{-9})
CNS	central nervous system	pg	picogram (10^{-12})
cpm	counts per minute	p.o.	orally
DNA	deoxyribonucleic acid	ppm	parts per million
e.g.	for example	r	Roentgen
g	gram(s)	RBC	red blood cells (erythrocytes), red blood count
µg	microgram(s)	resp.	respectively
hr	hour(s)	RNA	ribonucleic acid
i.m.	intramuscular	s.c.	subcutaneous
i.p.	intraperitoneal	sec	second(s)
IU	international unit(s)	U	unit(s)
i.v.	intravenous	UV	ultraviolet
kg	kilogram(s)	WBC	white blood cells (leukocytes), white blood count
LD ₅₀	median lethal dose(s)	wk	week(s)
m	meter(s)	wt	weight(s)
M	molar	yr	year(s)
mEq	milliequivalent(s)		
mM	millimolar		
µM	micromolar		
mC, µC	milli-,microcurie(s)		

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PREFACE

Carcinogenesis Abstracts is a publication of the National Cancer Institute. The journal serves as a vehicle through which current documentation of carcinogenesis research highlights are compiled, condensed, and disseminated on a regular basis. It represents an integral part of the Institute's program of fostering and supporting coordinated research into cancer etiology. Issues of *Carcinogenesis Abstracts* normally contain three-hundred abstracts and three-hundred citations (unaccompanied by corresponding abstracts). Abstracts and citations refer to the current scientific literature that describes the most significant carcinogenesis research carried on at the National Cancer Institute, other governmental agencies, and private institutions. *Carcinogenesis Abstracts* is intended to be a highly useful current awareness tool for scientists engaged in carcinogenesis research or related areas. The great number and diversity of publications relevant to carcinogenesis make imperative the availability of this service to investigators whose work requires that they keep abreast with current developments in the field.

Carcinogenesis Abstracts is normally published monthly. Volume XI covers the scientific literature published from Jan 1973 through Dec 1973. A cumulative subject and author index for Volume XI will be published shortly after the final regular issue. The first issue of Volume XI which would normally be dated July 1972 is being dated July 1972 - January 1973. This change is being made so that the date of publication of material included in each issue corresponds to the issue date. This journal is available free of charge to libraries and to individuals who have a professional interest in carcinogenesis. Requests for *Carcinogenesis Abstracts* from qualified individuals should include statements of their relationship to carcinogenesis research. All correspondence should be addressed as follows.

Carcinogenesis Abstracts
Room C-325
Landow Building
National Cancer Institute
National Institutes of Health
Bethesda, Maryland 20014

Use of Funds for Printing this publication
approved by the Director of the Bureau of
the Budget on July 25, 1967.

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- 6601 TUMOR-ASSOCIATED MEMBRANE ANTIGENS AND THE ANTITUMOR IMMUNE REACTIONS. (E.) Levy, J. P. (Hosp. St. Louis, Paris, France) and F. M. Kourilsky. *Transplant Proc* 5(4):1435-1440, 1973.

Tumor-associated membrane antigens can induce an immune rejection of the tumor cells in an autologous host. These antigens are classified as: virus-induced, fetal, individual tumor-specific antigens of chemically induced tumors, or differentiation antigens abnormally expressed on tumor cells. The specificity of the virus-induced tumor antigens is clearly related to the tumor-inducing virus and depends on the presence of the viral genome. The production of circulating antibodies against these antigens is poor. Several tumor-associated surface antigens are defined in RNA-virus-induced tumors. The role of circulating antibodies against surface antigens is not clear. Fetal antigens of tumor cell surface are considered as tumor virus-associated alterations of the cell metabolism or depression of embryonic antigens. These antigens are common to tumors of different etiology, thereby explaining certain cross-reactivities between tumors. The antibody response to the fetal antigen is weak and cell mediated immune reactions are weak. Individual antigens induced by chemical carcinogens are remarkably specific even in tumors induced in the same animal by the same carcinogen. Immune reactions of the host are weak and tumor rejection is negligible. Two kinds of tumor antigens are noted: those related to the etiology of the tumor, and those related to the cell differentiation state, including fetal differentiation, and perhaps organ or tissue-specific antigens. Tumor growth probably starts due to weakness of the immune response. The origin of the tumors in special sites may impair or delay the immune response or protect the tumor cells against this response entirely. (32 references)

- 6602 NATURAL HISTORY OF AUSTRALIA ANTIGEN AND HEPATOCELLULAR CARCINOMA. (E.) Nishioka, K. (Nat'l. Cancer Ctr. Res. Inst., Tokyo, Japan), M. Mayumi, K. Okochi, K. Okada and T. Hirayama. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 137-146, 1973.

Immune adherence hemagglutination and passive hemagglutination have been used in large-scale seroepidemiological studies to detect the Australia (Au) antigen and Au antibody, resp. While the Au antigen is found in small titers in a small percentage of normal persons and patients with hepatitis and cirrhosis, it is found in over 30% of patients with hepatocellular carcinoma (HCC). This observation has been made in Japan, the Philippines, Thailand, and Kenya, although in Kenya the antigen titers in the HCC cases were slightly lower than in the control cases. In contrast, the Au antibody is found in a smaller percentage of HCC patients than other cancer or control patients. In comparison with Au antigen HCC with cirrhosis, Au antigen positive HCC shows much less lymphoid cell infiltration classified as inactive cirrhosis. The following factors should be considered as possible influences on the chronic presence of the Au antigen: genetic

factors in the host; infection at an immunologically immature or insufficient state; and low dose infections. Three types of operational epidemiological studies should be undertaken to determine the relationship between the Au antigen and HCC: association studies on the individual, family, and racial levels; causation studies; and control studies. (19 references)

- 6603 MALIGNANT MELANOMAS OF THE FEMALE GENITALIA. PART I. (Ger.) Hempel, J. (Pathol. Inst., Wiesbaden Clinic, Germany) and W. Remmele. *Z Haut Geschlechtskr* 48(16):647-661, 1973.

A review is presented of morbidity statistics, site, gross and microscopic structure, histogenesis, differential diagnosis, etiology, familial occurrence, treatment and prognosis for malignant melanomas of the skin. In contrast to other forms of skin cancer, little is known about the etiology of malignant melanomas. Most investigators believe that chronic trauma plays little if any role in the transformation of melanocytic nevi into melanomas although trauma may promote metastasis of a preexisting melanoma. Since melanomas account for only a very small percentage of pigmented tumors, the fact that most intermediates involved in melanin synthesis are carcinogenic is not considered important. Although there are reports that malignant melanomas rapidly metastasize and lead to the death of about 100 pregnant women, there is no conclusive evidence that pregnancy or hormones cause these tumors. (No references)

- 6604 A MOLECULAR MODEL FOR CELL INTERACTION. (E.) Roth, S. (Dept. Biol., Johns Hopkins U., Baltimore, Md.). *Q Rev Biol* 48(4):541-563, 1973.

Early embryogenesis in higher animals proceeds through a series of complex morphogenetic steps followed by intercellular communications sufficiently sophisticated that most groups of cells learn their positions and their fates before physical evidence for differentiation can be detected. It has been assumed that molecular events at the cell surface are initially responsible for the recognition and communication between cell and environment in these systems, but the nature of these molecular events has been totally obscure. The argument that recognition and communication may result from interactions between cell surface glycosyltransferases and their cell surface glycosyl acceptors is discussed. If two cells possess surface enzymes and appropriate substrates, and if these are prohibited from interacting with each other on a single cell surface, then enzyme-substrate binding will occur between these two cells when they make contact. This relationship would account for intercellular recognition. By controlling the availability of the necessary sugar donor or the required cation, cells could control the degree to which these complexes undergo catalysis. If catalysis should take place, then the cells will have changed each other's surface carbohydrates. This, in turn, could initiate intracellular changes and might account for communication. Evidence for this model comes from studies on normal and malignant cells in culture, adhesive recognition between embryonic cells, organ culture of embryonic tissues, whole embryos,

platelet aggregation, and clearance of serum glycoproteins by the liver. (34 references)

6605 ARE PUFA HARMFUL? (E.) Anonymous. *Brit Med J* 4(5883):1-2, 1973.

Polyunsaturated fatty acids, while beneficial in reducing the incidence of fatal ischemic heart disease, may promote premature aging and cancer development. In the absence of antioxidants, such as vitamin E, polyunsaturated fatty acids are liable to be oxidized to epoxides and hydroperoxides which in turn polymerize to form ceroid pigments which are thought to be atherogenic. With prudent consumption of polyunsaturated fatty acids there seems little risk of developing cancer, however, some aliphatic epoxides, the early oxidation products of the unsaturated bond, are carcinogens. It is not certain if significant amounts of these epoxides are formed within the body from unsaturated fats. Neither is it known how much vitamin E is required in man to prevent such oxidation. It is suggested that persons consuming polyunsaturated fatty acids in quantity consider taking supplements of vitamin E and should remember that saturated, monounsaturated, and polyunsaturated fatty acids should be consumed in equal amounts. It is urged that manufacturers make clearer the meaning of the term "vegetable oils" on their labels so that consumers may avoid those oils which are particularly unsuitable for human consumption. (27 references)

6606 SYNCARCINOGENESIS AND ONCOGENE HYPOTHESIS. (E.) Nakahara, W. (Natl. Cancer Ctr. Res. Inst., Tokyo, Japan) and R. Tokuzen. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund*, Japan 367-379, 1973.

Almost all human cancers may be ascribable to the syncarcinogenic summation of very weak carcinogens of all sorts. Once a cell has undergone a sufficient number of persisting heritable alterations, it proceeds to form clinically recognizable cancer orthogenetically, without the aid of a "promoter" in the sense of the two-step hypothesis. Cell-free filtrate of a spontaneous transplantable lymphocytic sarcoma was injected into newborn syngeneic mice. The lymphocytic sarcomas thus produced were identical replicas of the original tumor and were consistently shown to contain virus-like particles resembling the C-type viruses of the murine leukemias. Similar particles were found in the lymph nodes of mice bearing s.c. grafts of the tumor and in the lymph nodes of mice which had been injected with the cell free filtrates but had failed to develop tumors. The injection of iododeoxyuridine into the lymph nodes of normal mice of the same strain produced no tumors, and no C-type particles have been found in the injected nodes. It is possible that there may be quantitative differences existing among oncogenes and that chemical and physical carcinogens add something to deficient or incomplete oncogenes. It is also possible that oncogenic viruses may vary as to their derepressing activities, with some being inadequate derepressors permitting

only partial expression of the oncogene and production of viral particles of low oncogenicity. (13 references)

6607 NEONATAL KIDNEY TUMOURS. (E.) Anonymous. *Brit Med J* 4(5893):627-628, 1973.

The majority of neonatal renal neoplasms are unencapsulated and infiltrate and replace some 50% to 90% of the renal parenchyma. The cut surface has a pale, whorled appearance without areas of hemorrhage and necrosis. Tissues are composed of elongated, spindle-shaped cells of both fibrous and leiomyomatous type, but thin-walled vascular sinusoids are evident as are foci containing glomeruli and renal tubules. It is suggested that these epithelial elements represent portions of kidney tissue which have been entrapped within the neoplasm. The presenting clinical feature is often an abdominal mass. Intravenous urography shows the tumor is of renal origin, but an abdominal neuroblastoma can give a similar pyelogram. The two are distinguished by estimation of the urinary excretion of catecholamine, raised with a neuroblastoma but not with a kidney tumor. These tumors behave as benign tumors with neither local recurrence nor distant metastases reported. Treatment should be limited to nephrectomy without postoperative irradiation or cytotoxic chemotherapy, due to high complication rates in infants. It is suggested that a mesenchymal neoplasm may progress to form a typical nephroblastoma and that delay in the removal of the former may be dangerous. (11 references)

6608 FOLLICULAR LYMPHOMA. A TUMOR OF THE GERMINAL CENTER. (E.) Lennert, K. (Path. Inst., U. Kiel, Germany). *Germ Monograph on Cancer Res* 15:217-231, 1973.

The concept of follicular lymphoma used in this paper is based upon a cytological analysis of germinal centers by hematological methods. From a study of their non-neoplastic germinal centers, the cells were classified as germinoblasts, germinocytes, or "large pyroninophilic cells" (immunoblasts). In addition, dendritic reticulum cells connected by desmosomes were specific for lymph follicles and the outer part of lymph node cortex. Histochemical studies of the germinal center showed the phagocytic reticulum cells have a high activity of non-specific esterase and acid phosphatase. The non-specific esterase activity was weaker in dendritic reticulum cells. A high content of 5-nucleotidase was noted in germinal centers. Tumors of germinal center cells are composed of the same cell types as normal germinal centers and are identifiable by their cytological features. In follicular lymphomas most cells are germinocytes, almost always mixed with a small or moderate number of germinoblasts. It has been possible to identify germinocytes, germinoblasts, reticulum cells (including the dendritic types), and some lymphocytes in the tumors with the light and/or electron microscope. Follicular lymphomas represent a special tumor of germinal center cells, a "germinoblastoma," which may on

occasion be diffuse as well as follicular in pattern of growth. When such tumors are composed entirely of only one type of cell, they are referred to as "germinoblastic sarcomas" and are diffuse more often than follicular. It is suggested that the classification of different types of malignant lymphomas as either diffuse or follicular be discarded and the clear separation of the germinoblastoma as the single proven form of follicular lymphoma be accepted. (23 references)

- 6609 MALIGNANT RETICULOHISTIOCYTOSIS. BORDER-LINE LESION BETWEEN REACTIVE AND NEOPLASTIC. (E.) Tanaka, N. (Chiba Cancer Ctr., Japan). *Gann Monograph on Cancer Res* 15:123-143, 1973.

Malignant reticulohistiocytosis has been classified according to its pattern from both cytological and histological aspects. Types according to histological pattern include leukemoid-blastomatous, synonymous with leukemic reticuloendotheliosis, and cataplastic, including Hodgkinoid lesion. Types according to cytological pattern are lymphoid-reticular, histiocytic-reticular, synonymous with histiocytic medullary reticulosis, and plasmacytoid-reticular with or without serum protein abnormality. Combined cases of these varieties as well as transitional cases from cataplastic to neoplastic are occasionally present. A total of 40 cases (9 females and 31 males, aged 2 to over 70 yr) were specifically reviewed for this study. This disease has the particular and characteristic clinical manifestations of fever, neoplastic-like lymphadenopathy, hepatosplenomegaly, anemia, leukemoid blood picture, jaundice, hepatic drainage, hemorrhagic diathesis, and skin lesion. Diffuse leukemoid proliferation of atypical malignant-appearing cells in the hematopoietic system appears to be the pathognomonic histological finding. These cells do not appear hemoblastic, but seem to be reticulum cell derivatives. Thus, malignant reticulohistiocytosis differs from Naegeli-type monocytic leukemia or stem cell leukemia. (31 references)

- 6610 A CONCEPT OF FOLLICULAR LYMPHOMA. A PROPOSAL FOR THE EXISTENCE OF A NEOPLASM ORIGINATING FROM THE GERMINAL CENTER. (E.) Kojima, M. (Fukushima Med. Coll., Japan), Y. Imai and N. Mori. *Gann Monograph on Cancer Res* 15:195-207, 1973.

Histological and cytological features of neoplastic cells of follicular lymphoma were examined with special regard to the presence of desmosomes under the presumption that a neoplastic growth of the germinal center cell system exists independently and that it may correspond with the neoplasm conventionally called follicular lymphoma. Ninety-two cases of follicular lymphoma were examined in this study, 3 cases of the lymphocytic well-differentiated type, 58 of the lymphocytic poorly differentiated type, 11 of the mixed lymphocytic and histiocytic type, and 20 of the histiocytic type, when divided according to the classification of Rappaport *et al.* Electron microscopic studies were made on 17 cases, in

all of which desmosomes were consistently confirmed among the neoplastic cells constituting the follicular growth pattern. From the results of histological and cytological studies in all these cases, it is obvious that the greater part of the cases of follicular lymphoma, except for those belonging to the lymphocytic well-differentiated type, fundamentally show the common features as seen in germinal centers of normal lymph nodes and in reactive follicular hyperplasia. On the basis of such features, the majority of follicular lymphomas of these various types may be regarded as neoplasm originating from the germinal center. In other words, it is conceivable that a neoplasm originating from the germinal center is independently present and is mainly expressed as follicular lymphoma. (5 references)

- 6611 ONCOGENES IN ONCOGENIC VIRUSES. (Rus.) Al'tshtein, A. D. (No affiliation). *Zh Vsesoiuz Khim Obshchestva im D. I. Mendeleeva* 18(6):630-635, 1973.

The oncogene theory is considered, and attempts to identify oncogenes in polyoma virus and adenoviruses are described. Although the theory has been advanced that oncogenes are a normal constituent of the genome in oncornaviruses, the author believes that the oncogene is of cellular, rather than viral, origin and is only incorporated into the virus by chance. This hypothesis is supported by studies of Rous sarcoma virus which showed that (1) the oncogene is not necessary for oncornavirus replication and can easily be lost along with the loss of genetic material; (2) the presence of an oncogene in the virion is often accompanied by the loss of the ability to replicate independently; and (3) the location of the oncogene differs in different strains of oncornaviruses. This hypothesis is also supported by the absence of oncogenes in oncornaviruses which have little or no oncogenic activity. In oncornaviruses, cellular genes (or, more accurately, their RNA copies) are incorporated into the viral genome so that the transforming activity of these viruses results from transduction of certain cellular genes. In DNA-containing oncogenic viruses, the oncogene can be considered to be a distant descendent of corresponding cellular genes which evolved, over a long period, into the viral genome and became a part of it. (55 references)

- 6612 RETICULOSARCOMA IN JAPAN. (E.) Akazaki, K. (Aichi Cancer Ctr. Res. Inst., Japan). *Gann Monograph on Cancer Res* 15:71-82, 1973.

Comprehensive studies have been made on the reticulo-endothelial system to clarify the cellular origin of reticulosarcoma. It was confirmed that this specific cell system is a functional unit morphologically composed of two kinds of cells. This conclusion is supported by the fact that two different kinds of malignant tumor, namely, reticulosarcoma and reticulo-endothelioma, originate from cells of this system. Reticulosarcoma, a tumor composed of malignantly transformed reticulum cells, originates mostly from reticulum cells in hematopoietic organs, particularly

lymphatic tissues, reticulosarcoma of bone marrow, and reticulosarcoma of other organs and tissues. Histologically two classifications are used, differentiated and undifferentiated. Reticulosarcoma is prevalent among malignant lymphomas in Japan. More than half the cases of the Japanese Lymphoma Study Group are reticulosarcoma. Lymphosarcoma and Hodgkin's disease are relatively rare as compared with the frequency in the U.S.A. and Great Britain. Furthermore, the age-specific death rates recorded by the Ministry of Health and Welfare show an increase in the prevalence of malignant lymphoma, which is attributed to the increase of reticulosarcoma. (30 references)

- 6613 LYMPHOCYTE REACTIVITY IN HODGKIN'S DISEASE: A LYMPHOCYTE CIVIL WAR. (E.) DeVita, V. T., Jr. (Natl. Cancer Inst., Bethesda, Md.). *N Engl J Med* 289(15):801-802, 1973.

Lymphocyte reactivity in Hodgkin's disease is reviewed and a new hypothesis for the origin of the disease and an explanation for its peculiar manifestations is given. It is proposed that the malignant cell in Hodgkin's disease is, in fact, a T lymphocyte (thymus derived) perhaps antigenically altered and transformed by a virus. A B-lymphocyte response to the malignant cell with the production of antibodies having cross-specificity to non-malignant T cells would account for the observed reactive hyperplasia, circulating lymphoblastic cells and increased antibody production seen in this disease. It could also account for the uniquely early appearing energy, the progressive loss of T-lymphocyte function, and other T-cell-related abnormalities observed in the past, such as the difficulty of transferring delayed hypersensitivity with transfer factor and the loss of phytohemagglutinin responsiveness even before lymphocyte depletion occurs. Cross-reactivity with other blood elements in some cases could explain the not uncommon autoimmune phenomenon associated with Hodgkin's disease. (5 references)

- 6614 THRESHOLDS IN TOXIC, TERATOGENIC, MUTAGENIC, AND CARCINOGENIC EFFECTS. (E.) Freese, E. (Natl. Inst. Hlth., Bethesda, Md.). *Environ Health Prospect* (6):171-176, 1973.

Individual cells of an adult organism may be inhibited or killed without consequence to the whole organism. When cell death or inhibition occurs in large numbers of cells, toxic effects or sterility may result. During the embryonic stage, however, the effect of only a few cells may produce malformations, teratogenic effects. If the rate at which the organ performs its given function is not dependent on the number of cells it contains, then the toxic effect will not be observed until a certain threshold value is exceeded by the number of cells killed. Threshold values occur frequently in toxic and inhibitory cell reactions. A threshold phenomenon occurs only rarely in mutagenic alterations. The mutagenic or carcinogenic effects of a compound observed at high doses of that compound, must be extrapolated either linearly or with some exponent of the concentration to the

spontaneous background effect of zero dose if adequate protection from mutagenic alterations are to be offered to the public. (23 references)

- 6615 MALIGNANT MELANOMAS OF THE FEMALE GENITALIA. PART III. (Ger.) Hempel, J. (Pathol. Inst., Wiesbaden Clinic, Germany) and W. Remmele. *Z Haut Geschlechtskr* 48(18):759-774, 1973.

From a survey of the literature, data are presented for the sites of malignant melanomas of the female genitalia, the percentage of these tumors among all tumors of the female genitalia, age and racial distribution, the relationship between these tumors and parity, clinical symptoms, size at diagnosis, clinical diagnosis, histological findings, lymph node and other metastases, clinical course and survival times. (No references)

- 6616 GRAFT VERSUS HOST REACTION; ALLOGENIC DISEASES: LYMPHOMAS. (Ger.) Grundmann, E. (Pathol. Inst., U. Munster/Westphalia, Germany) and H. P. Hobik. *Beitr Pathol* 150(4):323-329, 1973.

Runt disease in young mice, embryo disease in chicks and secondary disease in mammals are three examples of graft versus host reaction (GVHR). Blast cells in the spleen originate with the host, while those in the liver are primarily donor cells. If older animals are used or if acute GVHR is averted by immunosuppression, the animals develop a variety of symptoms which result solely from a reaction to foreign T-lymphocytes. This is called chronic allogenic disease. Acute GVHR occurs in human bone marrow recipients when histocompatibility antigens are not matched closely enough and in male infants who receive maternal lymphocytes *in utero* through the placenta. Lymphomas (large-cell lymphomas or small-cell reticulum cell sarcomas) occur in 80% of mice with chronic GVHR or allogenic disease. The incidence of lymphoreticular tumors is also increased in NZB/NZW mice which have a congenital immune deficiency; this has also been found in man. There is some evidence that these tumors result from the unmasking of viruses which provide genetic information for malignant growth. (8 references)

- 6617 HUMAN TUMOR KINETICS. (Fr.) Le Fur, R. (Gustave Roussy Inst., Villejuif, France). *Ouest Med* 26(9):1023-1029, 1973.

After reviewing the literature on tumor doubling time, the duration of the cell cycle in tumor cell mitosis, factors accounting for the disproportion between the duration of the cell cycle and tumor doubling time, and the kinetics of DNA synthesis in tumors, the results of unpublished research performed at the Gustave Roussy Institute are presented. A study of cell loss in embryonic tumors, hematosarcomas, mesenchymal tumors, epitheliomas, and adenocarcinomas showed that, with the exception of mesenchymal sarcomas, cell loss increases with an increase in the number of cells produced in a tumor.

The growth fraction, which is the most important parameter in tumor growth, can vary from 4% in adenocarcinomas to 80% in embryonic tumors. The effects of radiotherapy and chemotherapy on the cell cycle and tumor doubling time are discussed. (6 references)

- 6618 REGULATION OF IMMUNOLOGICAL TUMOR-HOST RELATIONSHIPS IN VIRUS-INDUCED MAMMARY CANCER IN THE MOUSE. (Ger.) Müller, M. (Carl Gustav Carus Med. Acad., Dresden, Germany), S. Zotter, H. Grossmann and C. Kemmer. *Arch Geschwulstforsch* 42(3):181-191, 1973.

On the basis of the author's 8 yr of experience and an analysis of the literature, a review is presented about immunological interactions between virus-induced murine mammary carcinomas and hosts infected with mammary tumor virus (MTV). Most of these results were obtained with an MTV-infected strain of CBA/Bln mice. Mice infected perinatally with MTV commonly develop a humoral and cellular immune response to MTV antigens, rather than the complete immunological tolerance that was previously postulated. This basic immunity to MTV may explain in part differences in the behavior of transplanted mammary tumors in MTV-free and MTV-infected mice. The antigenic composition of the tumor cells produces qualitative and quantitative differences in the extent of the immunological reaction of the tumor host. Thus, it is conceivable that the secondary immunological response to viral antigens in the tumor cell is blocked by humoral immunity. The basic immunity may also interfere with immunogenicity of MTV-associated antigens of the tumor cell by "afferent enhancement". (44 references)

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- 6619 ALTERATIONS IN HAMSTER CELL REGULATORY MECHANISMS RESULTING FROM ABORTIVE INFECTION WITH AN ONCOGENIC ADENOVIRUS. (E.) Strohl, W. A. (Rutgers Med. Sch., New Brunswick, N.J.). *Prog Exp Tumor Res* 18:199-239, 1973.

The abortive infection of hamster cell line BHK21/13 with type 12 adenovirus (Ad12) is discussed in terms of the expression of Ad12 virus functions during abortive infection, alterations in the control of the cell cycle resulting from abortive infection, and the loss of hamster cell capacity to support Ad12 replication. Specific topics include: adsorption; the synthesis of Ad12 T antigen; virus-specific RNA synthesis; absence of the synthesis of virus DNA, virion antigen, and infectious virus; altered controls exhibited by Ad12-transformed BHK21 cells; the G1 phase-arrested BHK21 cell system, the induction of cellular DNA synthesis by the Ad12 infection of G1 phase-arrested cells; the stimulation of cellular RNA synthesis by Ad12 infection of G1 phase-arrested cells; the effect of alterations in the control of the cell cycle on cellular protein synthesis; adenovirus-induced tumor and transformed cells; and restrictions to Ad12 replication in BHK21 cells abortively infected with Ad12. (37 references)

- 6620 SEX-RELATED RESISTANCE IN HAMSTERS TO ADENOVIRUS ONCOGENESIS. (E.) Yohn, D. S. (Dept. Vet. Path., Ohio State U., Columbus). *Prog Exp Tumor Res* 18:138-165, 1973.

The effects of sex differences on the resistance of hamsters to adenovirus oncogenesis are discussed in terms of extrinsic and intrinsic factors. Specific topics include: the influence of virus dose and the route of inoculation; the susceptibility of male and female hamster cells to adenovirus oncogenesis; the development of immunologic competence; the influence of immunologic impairment on adenovirus type 12 (Ad12) oncogenesis; the development of sexual maturity; sexual dimorphism of the Syrian hamster adrenal cortex; the influence of gonadectomy and/or exogenous sex hormones on Ad12 oncogenesis; and the influence of sex hormones on the adenovirus transformation of hamster cells *in vitro*. To account for the greater efficiency of adenovirus oncogenesis in female hamsters, it is proposed that in each animal (given sufficient virus at birth), a critical tumor mass or cell number is reached that is less frequently rejected by females owing to estrogenic stimulation of tumor growth prior to the development of total immunologic capacity. (60 references)

- 6621 THE PARA-ADENOVIRUSES. (E.) Rapp, F. (Milton S. Hershey Med. Ctr., Pennsylvania State U., Hershey). *Prog Exp Tumor Res* 18:104-137, 1973.

The abortive cycle of human adenoviruses in simian cells is discussed, along with the enhancement of human adenoviruses by simian papovavirus 40 (SV40). In light of this background, the discovery and characterization of the PARA (particle aiding the replication of adenoviruses)-adenoviruses are discussed. The biological properties of the PARA-adenoviruses are considered in terms of their ability to induce SV40 markers, their host range, their plaque kinetics, their replication, their transcapsidation, and their transformation *in vivo* and *in vitro*. A section on the biophysical properties of the PARA-adenoviruses covers their inactivation, purification, and hybridization. The implications of the research data on the PARA-adenoviruses are discussed. (115 references)

- 6622 STRUCTURE AND FUNCTION OF VIRION PROTEINS OF ADENOVIRUSES. (E.) Philipson, L. (Wallenberg Lab., Uppsala U., Sweden) and U. Pettersson. *Prog Exp Tumor Res* 18:1-55, 1973.

The structure and function of the virion proteins of the adenoviruses are discussed in terms of the architecture of the virion, the adenovirus genome, the multiplication of the virus, the structural proteins, the composition of the virion, and the functional aspects of the virion proteins. Specific topics include: the productive cycle, including adsorption and penetration and the synthesis of the viral RNA, DNA, and proteins; the abortive cycle; the morphology, physicochemical and immunological properties, and crystallization of the hexon, the fiber, the penton, and the major core protein;

hemagglutination; neutralization of the adenoviruses; the physiological effects associated with the fiber, penton, and hexon; and prospects for the function of the virus proteins. (188 references)

- 6623 THE CHICKEN EMBRYO LETHAL ORPHAN VIRUS (CELO). (E.) Slifkin, M. (Allegheny Gen. Hosp., Pittsburgh, Pa.) and L. P. Merkow. *Prog Exp Tumor Res* 18:88-103, 1973.

The chicken embryo lethal orphan virus (CELO) is discussed in terms of its occurrence; its physical and chemical properties; its classification and immunological associations; its oncogenesis; and its replication and pathogenicity in the chicken, chicken embryo, the chorioallantoic membrane, and tissue culture. While the CELO virus is a valuable agent for basic virus studies, our knowledge concerning its biologic characteristics is far from complete. In particular, while the CELO virus has a relatively high oncogenic and transformation potential, its oncogenic potential in relation to man cannot yet be ascertained. (60 references)

- 6624 ONCOGENIC AND NONONCOGENIC MUTANTS OF ADENOVIRUS 12: INDUCTION OF CHROMOSOME ABERRATIONS AND CELL DIVISIONS. (E.) Stich, H. F. (Cancer Res. Ctr., U. British Columbia, Vancouver, Canada). *Prog Exp Tumor Res* 18:260-272, 1973.

Human adenoviruses can be highly, weakly, or nononcogenic when injected into newborn Syrian hamsters. To determine whether the various types of human adenovirus also differ in their capacity to interfere with the genome of the infected cells, the radiomimetic effect of the weakly and nononcogenic cytotoxic (cyt) adenovirus 12 mutants was compared with that of the highly oncogenic cyt 143, the equally potent cyt+6 and cyt+129 revertants, and two parental strains. The various strains did not differ in the type or frequency of chromosome aberrations which they induced in embryonal Syrian hamster cells. In another study, the capacity of cyt mutants, revertants, and parental strains to initiate DNA synthesis in host cells was examined. These strains did not differ significantly in their ability to induce cellular DNA synthesis in nonpermissive cells, indicating that the capacity of the virus to trigger nondividing cells into DNA synthesis is independent from its oncogenicity. The various adenovirus strains also did not differ in their ability to stimulate cell division in nonpermissive systems, and the amount of neoantigen formed and its distribution in the cell were not affected by the cyt mutation. (36 references)

- 6625 CONTRIBUTIONS OF CLONAL SYSTEMS TO NEUROBIOLOGY. (E.) Ruddle, F. H. (No Affiliation), P. G. Nelson and G. Sato. *Neurosci Res Program Bull* 11(5):417-473, 1973.

The contributions of clonal systems to neurobiology are reviewed with regard to the mouse C-1300 neuro-

blastoma. The electrophysiological properties of the neuroblastoma are considered in terms of the responses of several clones in tissue culture and synaptic interactions *in vitro*. The morphology of this cell line is discussed in terms of cells which have been grown in suspension culture or in bacteriological petri dishes and those that have been cultured on substrates under conditions which promote neurite formation. Attention is also given the differentiation of neuroblastoma cells in hypertonic medium, neuroblastoma cell karyotypes, and molecular phenotypes. The regulation of molecular phenotypes is considered with regard to round versus extended cells; culture cycle differences; the effects of hormones, cyclic AMP, and other agents; and the expression of neuronal characteristics *in vitro* and *in vivo*. Additional sections cover neuroblastoma cell hybrids, synaptosome isolation and the development of an anti-nerve-ending antiserum, and the phenotypes of normal neural tissue in primary explants. The latter topic is discussed in terms of embryonic brain tissue and spinal cord, muscle, and dorsal root ganglion cells. (No references)

- 6626 THE ROLE OF Ca^{++} IN TUMOR GROWTH. (Fr.) Roth, P. C. J. (Animal Lab., Jardin des Plantes, Paris, France). *Rev Pathol Comp Med Exp* 10(1):23-24, 1973.

Fibromyomas, induced in rabbits by s.c. implantation of estradiol benzoate, regressed when 2.5 ml/liter acetic acid was added to their drinking water (pH 4.5). During regression the tumors became calcified, suggesting that acidification of the diet increases calcium binding. Alkalization with sodium bicarbonate (pH 8.5) caused loss of Ca^{++} and an increase in tumor growth (benign or malignant). One investigator found that the blood pH was 7.329-7.360 in patients with benign tumors (fibromas, adenomas, lipomas), 7.588-7.634 in patients with malignant tumors, and around 7.736 in patients with generalized cancer. These findings suggest that measurement of the blood pH once or twice a year might be used for the early diagnosis of cancer. Although it may be simplistic, it is suggested that cellular metabolism, and therefore tumor growth, is synergized by Na^{+} and K^{+} and inhibited by Ca^{++} and Mg^{++} . (20 references)

- 6627 NATURE AND MECHANISM OF CELL CHANGES IN TUMOR DEVELOPMENT. (Rus.) Vasil'ev, Iu. M. (Inst. Experimental Clinical Oncol., Leningrad, USSR). *Ark Patol* 35(1):3-13, 1973.

The multiplication of normal cells is regulated by (1) fluid medium (intercellular fluid in the body or nutrient medium in cell cultures), (2) the non-cellular substrate to which cells are attached (basal membrane or connective tissue in the body, plastic or glass containers in cell cultures), and (3) others cells with which a cell comes into contact. All three of these regulatory factors may be disturbed in tumorigenesis. Carcinogenesis is characterized by a decrease in the threshold concentration of nutrients required for growth. Tumor

cells acquire the ability to multiply without a noncellular substrate, and growth becomes independent of the cell density. Some tumor cells are able to synthesize growth factors and to secrete them into the medium, speeding up the growth of both normal and tumor cells. Morphologically, cancer cells become disorganized and changes occur in their ability to make contact with neighboring cells and noncellular substrate. Progressive disturbances occur in the cell's ability to differentiate: some tumor cells become more highly specialized, while others undergo dedifferentiation. Some of the regulatory disorders in tumor cells may be due to changes in the structure of the cell surface or to changes in the activation of receptors located on the cell surface. Genetic analyses of a number of human and animal tumors have shown that most tumors develop from the multiplication of a single tumor cell. This results from incorporation of a viral genome into the cell genome, from chromosomal and genetic mutations which alter the cell genome, or from epigenetic changes. (79 references)

- 6628 BRAIN TUMORS IN CHILDREN. (Fr.) Turpin, J.-C. (St. Vincent de Paul Hosp., Paris, France) and J. Delpech. *Rev Pediatr* 9(5):279-301, 1973.

Brain tumors are among the most common tumors found in children. Although they can occur at any age, most are diagnosed in children between the ages of three and seven yr. In 50% of all cases, these tumors are located in the posterior cranial fossa. The histological type most frequently encountered is the glioma (75-80%), followed by craniopharyngiomas (16%). Tumors more rarely found in children are colloid cysts of the third ventricle, papillomas of the choroid plexus, pinealomas, cerebellar hemangioblastomas, epidermoid or dermoid cysts, pituitary adenomas, chordomas, hamartomas, and neurinomas. Although metastases are rare in children, they do occur with some sympathicoblastomas. Clinical symptoms, diagnosis, and treatment are discussed. (22 references)

- 6629 GENETIC FACTORS IN THE NATURAL HISTORY OF MURINE LEUKEMIA VIRUS INFECTION: G.H.A. CLOWES MEMORIAL LECTURE. (E.) Rowe, W. P. (Nat'l. Inst. Hlth., Bethesda, Md.). *Cancer Res* 33(12):3061-3068, 1973.

The history of tumor virology consists of four stages, the last of which has been characterized by the concept that tumor viruses are an integral part of the host. An oncogene theory to explain the expression patterns of the murine leukemia viruses (MuLV) holds that the viral genetic material is present in normal cells, that it can be expressed as infectious virus or only as viral antigens without production of virus, and that the noninfectious expression of a protein of the viral genome may be responsible for the cellular alteration leading to cancer. Studies of the MuLV in the AKR mouse revealed that the complete viral genome is an integral, heritable component of all AKR cells, that it can be present in unexpressed

form, and that it does not render the cells resistant to superinfection by the same virus. Genetic and progeny studies showed that the MuLV genome is a heritable component of AKR cells and that its presence or expression in hybrids is genetically controlled. The AKR possesses two unlinked, presumably identical virus loci, and there is some indication that the virus-inducing loci are the structural genes of the virus. The virus-inducing loci are relatively stable and preliminary findings suggest that the viral genomes are not inserted at allelic sites in different strains. Present evidence indicates that MuLV genomes are chromosomally located, with at least three genes being involved in the etiology of AKR lymphoma. (25 references)

- 6630 THE AFLATOXINS AND HUMAN LIVER CANCER. (E.) Linsell, C. A. (Nairobi Regional Ctr. International Agency Res. Cancer, Kenya) and F. G. Peers. *Recent Results Cancer Res* 39:125-129, 1972.

The possible association between aflatoxin and human liver cancer was studied in the Murang'a district of Kenya; the project was based on the examination of food ready for ingestion. The results indicated that aflatoxin was ingested and could be measured in mixed food samples; there were no seasonal effects on aflatoxin levels. An association between aflatoxin exposure levels and liver cancer was found; urbanization with changes in food habits and the sources and storage of cereals might greatly reduce the risk of cancer. There is some support for the notion that the cellular regeneration associated with chronic hepatitis and cirrhosis may provide susceptible targets for the action of aflatoxin. There is also some indication that age may have an effect on the susceptibility of humans to aflatoxin. Foodstuffs contaminated at nearly lethal levels of aflatoxin might be acceptable to young children, and there have been several reports of fatal cases of acute hepatitis in children associated with toxic rather than infectious agents. There is a possibility that exposure to a near lethal dose of aflatoxin in childhood might modify the template activity of DNA and greatly increase the risk of liver cancer later in life. (16 references)

- 6631 ESOPHAGEAL AND STOMACH PRECANCER. (Ger.) Hafter, E. (Zurich, Switzerland). *Helv Chir Acta* 40(5/6):593-602, 1973.

From a critical review of the literature and his own experience, the author concludes that Plummer-Vinson syndrome (sideropenic dysphagia), achalasia, and alkaline burns of the esophagus are precursors of esophageal carcinoma. With the exception of Plummer-Vinson syndrome, however, the incidence of cancer in patients with these conditions is low. Possible precancerous conditions of the esophagus are benign strictures, diverticula, gastrectomy, and celiac disease. The association between esophageal cancer and reflux esophagitis caused by hiatus hernia appears to be an age-related coincidence. Nicotine and alcohol appear to be more im-

portant in the etiology of esophageal cancer than any of the precancerous conditions mentioned above. Adenomatous polyps, villous adenomas, chronic atrophic gastritis, atrophic gastritis associated with pernicious anemia, and partial gastrectomy are considered precancerous conditions of the stomach. It is possible, but rare, for benign ulcers to undergo malignant transformation. These "ulcer carcinomas" are generally primary infiltrating carcinomas which produce ulcers because of increased pepsin secretion. Gastric ulcers and gastric polyps should be treated surgically to prevent development of stomach cancer, but the incidence of esophageal or gastric cancer is so low in other precancerous conditions discussed here that prophylaxis is not considered practical. (29 references)

- 6632 THYROID CANCER AND HORMONES. (Fr.)
Couette, J.-E. (Francois Baclesse Ctr.,
Caen, France). *Ouest Med* 26(7):701-710, 1973.

There is conflicting clinical and epidemiological evidence about the role of thyroid-stimulating hormone (TSH) in the development of thyroid cancers. However, experimental evidence indicates that increased secretion of TSH cannot induce a thyroid tumor but will promote its growth. Other studies indicate that a deficiency of male hormones and corticosteroids may also promote tumor growth. Disturbances in hormone production are associated with all thyroid cancers, but are most pronounced in differentiated tumors and their metastases. Carcinomas of the thyroid medulla, which secrete large quantities of calcitonin, are familial in 15-20% of all cases. These tumors are often associated with other endocrine disorders such as pheochromocytoma, parathyroid adenoma, and Sipple's syndrome. Early diagnosis and treatment is possible by screening these high-risk families for calcitonin. Since hormone therapy (thyroid hormones, estrogens, androgens, and corticosteroids) has not proven effective, surgery is the treatment of choice. (53 references)

- 6633 HORMONE DEPENDANCE OF BREAST CANCER.
(Fr.) Juret, P. (Francois Baclesse Ctr.,
Caen, France). *Ouest Med* 26(7):737-747, 1973.

After reviewing clinical and experimental studies which demonstrate the effects of hormones on breast cancer, the author presents five illustrative case reports. A rapidly growing lump developed in a 53-yr-old woman 1 wk after she had been given estradiol hexahydrobenzoate (5 mg/month) for hot flashes. The patient died of breast cancer 10 months later. Oophorectomy caused immediate regression of bone metastases in a 41-yr-old woman who had breast cancer. Bone metastases reappeared 5 months later after the patient was given 5 mg estradiol benzoate for hot flashes. Bone metastases from breast cancer were controlled in a 46-yr-old woman by oophorectomy followed by androgen therapy (100 mg testosterone propionate twice a wk). A simultaneous decrease occurred in urinary estrogen excretion. Redevelopment of metastases, six months later, was accompanied by an increase in urinary estrogen excretion, and

the patient died soon afterwards. The recurrence is attributed to partial conversion of the androgen into estrogen due to a metabolic disorder. In a 76-yr-old woman an ulcerated carcinoma of the breast responded to radiotherapy, but ulceration recurred after three months. The lesion was controlled for two yr by daily administration of a combined estrogen-progestagen preparation. A 39-yr-old woman with multiple bone metastases from a breast cancer and an ulceration of the breast responded to destruction of the pituitary and irradiation of the breast. This improvement, which lasted for 8 yr, was accompanied by a decrease in follicle-stimulating hormone. The patient died six months later of a hepatic metastasis. (38 references)

- 6634 CARCINOGENESIS - CELLULAR EVOLUTION AS A UNIFYING THREAD: PRESIDENTIAL ADDRESS.
(E.) Farber, E. (Temple U. Sch. Med., Philadelphia, Pa.). *Cancer Res* 33(11):2537-2550, 1973.

Neoplastic cell populations appear to be characterized by two groups of properties: some that indicate the ability to differentiate normally and abnormally; and some that point to some basic genetic defects. The causes of cancer can also be grouped into two categories: those with nucleic acid that can be translated by target cells; and those that can only alter or destroy the preexisting information content of the host cell. There are two major hypotheses concerning the carcinogenic process: according to one the problem is essentially the development or evolution of a cancer cell, while according to the other, the problem is the development or evolution to a cancer cell. The first step in carcinogenesis is initiation, which may involve somatic mutation or altered or aberrant differentiation. Initiation with chemicals may consist of permanent damage to DNA by virtue of the induction of double-stranded DNA damage followed by faulty repair as well as by the induction of irreparable alterations. The remaining steps in carcinogenesis are unclear, although the process generally involves the proliferation of nonneoplastic cells. While many neoplasms express phenotypic properties not seen in the corresponding normal adult cell or tissue, the time of expression of these properties is not well understood, although it seems to vary according to the specific property in question. Carcinogenesis *in vitro* and the relationship between viruses and carcinogenesis are discussed. (110 references)

- 6635 BIOLOGIC PARAMETERS OF ADENOVIRUS TRANSFORMATION. (E.) Casto, B. C. (Rush-Presbyterian-St. Luke's Med. Ctr., Chicago, Ill.). *Prog Exp Tumor Res* 18:166-198, 1973.

Some of the parameters which affect the outcome of the *in vitro* interaction between oncogenic adenoviruses and embryonic hamster cells are discussed. A section on methods and assay conditions includes the preparation and use of cells, the serum requirements, the requirements for cell DNA synthesis, and the isolation and growth of single clones. The influence of the virus on cell transformation is dis-

cussed in terms of the properties of the adenovirus-transformed cells, while the cellular regulation of adenovirus transformation is discussed in terms of the transforming potential of cells from different organs, the effect of cell age *in vivo* on adenovirus transformation, and the effect of cell sex on transformation. A final section on other factors which influence adenovirus transformation covers interferon and adeno-associated virus, along with the enhancement of transformation frequency via UV irradiation or the addition of 5-bromodeoxycytidine or dibenz(a,h)anthracene. (101 references)

- 6636 THE SIGNIFICANCE OF ASBESTOS IN TISSUE.
(E.) Wagner, J. C. (Llandough Hosp., Penarth, Glamorgan, Wales). *Recent Results Cancer Res* 39:37-46, 1973.

There are several types of asbestos, all of which are fibrous silicates and have similar properties. Chrysotile, amosite, and crocidolite are commercially important types of asbestos. Between 1935 and the present time, evidence has accumulated to indicate that carcinoma of the lung may be associated with the incidence of severe pulmonary fibrosis due to heavy asbestos exposure; there is also some indication that the different types of asbestos vary in their biological effect. Epidemiological studies in numerous countries have shown increases in lung carcinoma among workers heavily exposed to asbestos fibers and/or dust. The inoculation of asbestos preparations into rats has consistently produced a high incidence of mesotheliomas, while inhalation by rats produces an excess of lung adenomas with a low frequency of mesotheliomas. Removal of the oils in the asbestos samples prior to inoculation did not reduce the incidence of mesotheliomas. The more finely ground samples produced more mesotheliomas. Asbestos fibers are inhaled deeper into the lungs when the fibers are straight and slender; thus chrysotile fibers, which resemble stretched coils, are not inhaled as deeply as the straight amphibole fibers. Carcinomas of the lung are associated with moderate-to-severe fibrosis of asbestosis, but there is no evidence to implicate a particular type of asbestos. The incidence of carcinoma can probably be greatly reduced by good industrial hygiene. Since mesotheliomas appear to occur after slight exposures to crocidolite, the use of this type of fiber should be restricted if not essential. The use of chrysotile carries only a small risk if good dust control practices are maintained. (36 references)

- 6637 SIMIAN ADENOVIRUSES. (E.) Merkow, L. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.) and M. Slifkin. *Prog Exp Tumor Res* 18:67-87, 1973.

The simian adenoviruses are discussed in terms of their history, the gross pathology and histopathology of the tumors which they induce, sex-related influences, intracranial neoplasms, i.p. neoplasms, s.c. neoplasms, the rescue of oncogenic simian adenovirus, the ultrastructure of neoplastic cells *in vivo* and *in vitro*, and simian adenovirus tumor antigens. The inoculation of the oncogenic simian viruses by

various routes results in tumors with almost identical histopathologic morphology regardless of the location. Thus, the pattern of the induced neoplasm is more closely related to the viral genome in these cases than to that of the target cell, supporting the contention that many oncogenic adenoviruses have sufficient genome material to induce neoplastic transformation in almost any type of cell *in vivo* or *in vitro*. (92 references)

- 6638 INTERACTIONS OF ADENOVIRUS TYPE 12 WITH HOST CELL CHROMOSOMES. (E.) zur Hausen, H. (Inst. Clinical Virol., U. Erlangen, Germany). *Prog Exp Tumor Res* 18:240-259, 1973.

Some biological and biophysical aspects of the interactions between adenovirus type 12 and host cell chromosomes are discussed in terms of adenovirus-induced chromosomal aberrations, the fate of cells revealing chromosomal aberrations, the stimulation of cellular DNA synthesis by adenoviruses, and the fate of the infecting adenovirus genome. Specific topics covered include: chromosomal aberrations in nontransformed tissue culture cells and adenovirus type 12-transformed cells; the mechanisms of adenovirus-induced chromosomal aberrations; autoradiographic studies on the association of viral DNA with host cell chromosomes; immunofluorescence studies on the persistence of viral genome functions; and biophysical studies on the integration of the viral DNA into the host cell chromosomes. (69 references)

- 6639 TIMETABLE FOR HEPATOCARCINOGENESIS IN RAT. (E.) Kitagawa, T. (Cancer Inst., Tokyo, Japan) and H. Sugano. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 91-105, 1973.

Male Donryu rats were maintained on a diet containing 0.06% 3'-methyl-4-dimethyl-aminoazobenzene (3'-Me-DAB). A marked proliferation of oval cells and small hepatocytes along with a rapid fading of mature hepatocytes was noted within 2 wk. From about the sixth wk, nodular hyperplasias appeared which varied greatly in glucose-6-phosphatase, canalicular ATPase, alkaline phosphatase, acid phosphatase, and β -glucuronidase activity. Overt carcinomas appeared after the fifteenth wk. The oval cells appeared to produce α -fetoprotein in the early phase, while the mixed type carcinomas produced it in the last phase. A slight proliferation of oval cells occurred from the third to sixth wk in rats fed a diet containing 0.03% N-2-fluorenyl-acetamide (N-2-FAA). From about the sixth wk, hyperplasias appeared which were markedly deficient in glucose-6-phosphatase, canalicular ATPase, and β -glucuronidase activity. Overt carcinomas, mostly of the trabecular type, appeared after the twenty-fourth wk. Serum α -fetoprotein appeared in a pattern similar to that seen with 3'-Me-DAB, but in much lower concentrations. Scattered single cell necrosis or centrilobular focal necrosis of the mature liver cells was seen in rats consuming water containing 100 ppm diethylnitrosamine; there was no marked

cellular proliferation. After the fourth wk, hyperplasias with marked β -glucuronidase, glucose-6-phosphatase, and canalicular ATPase activities appeared. Carcinomas of mixed and trabecular types appeared after the twelfth wk. Serum α -fetoprotein was not observed in the early phase. (18 references)

- 6640 RELATIONSHIP BETWEEN CARCINOGENESIS AND IMMUNITY. (E.) Kobayashi, H. (Hokkaido U. Sch. Med., Sapporo, Japan). *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 381-388, 1973.

Most factors that are carcinogenic may also be simultaneously immunosuppressive to the host. Further, some immunological deficiency diseases are related to the development of cancer, and immunosuppressive drugs used for organ transplantation often induce new cancers in the host. Cancer can also be induced in the host by genetic, nutritional, or hormonal conditions which decrease the host's immune responses. Murine virus induced tumors and a number of chemically induced and spontaneous sarcomas and cancers of the breast, lung, and liver grow in rats which have been rendered tolerant to Friend or Gross viruses and in rats which have been immunologically suppressed with radiation or chemicals, but not in normal susceptible adult rats. Thus, the presence of cancer cells in the body does not mean clinical cancer unless specific tolerance or nonspecific immune suppression is also present in the host. There is some evidence that a general decrease in the immune responses of the host resulting from irradiation or chemical carcinogens may not always be necessary to allow tumor growth, and that specific tolerance alone may be sufficient. Tumor-specific transplantation antigen and autochthonous tumor cells may be useful in inhibiting carcinogenesis from the viewpoint of specific immunity on the part of the host, while BCG might be used to inhibit carcinogenesis from the viewpoint of non-specific immunity. (31 references)

- 6641 TYPES OF PROSPECTIVE STUDIES NEEDED IN CANCER RESEARCH. (E.) Hammond, E. C. (Dept. Epidemiology Statistics, American Cancer Soc., New York) and I. J. Selikoff. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 41-49, 1973.

Prospective epidemiologic methods should be employed to investigate the effects of agents to which large numbers of people are exposed and which are also under suspicion of contributing to the development of cancer. For each agent under investigation, it is desirable to study a well-defined cohort of people who have been heavily exposed to it for at least 20 yr and for whom adequate records are available. This approach has been used to study the carcinogenic effects of benzo(a)pyrene and asbestos; the effects of the latter on the families of the exposed individuals were also studied. Special attention should be given substances such as dieldrin which may be carcinogenic but which have been so recently

introduced that few people have been heavily exposed to them for as long as 20 yr. The effects of potentially carcinogenic drugs, such as Isoniazid, can be studied by tracing the first group of people treated with them as well as the children who were exposed *in utero*. Studies should also be made of factors which, in combination with other factors produce an increase risk of cancer; such factors might include cigarette smoke in combination with exposure to asbestos or uranium. When accurate records of heavily exposed individuals are not available, a study population with information concerning the factor(s) in question can be obtained by questioning a large number of people drawn from the general population or from some identifiable subgroup. These studies provide control data for the more restricted studies and for multiple factor analyses of cancer and other serious diseases. A matched group analytic technique which makes use of computers is described. (29 references)

- 6642 AUSTRALIA ANTIGEN AND ALPHA-FETOPROTEIN IN RELATIONSHIP TO MORPHOLOGY OF CIRRHOSIS AND/OR HEPATOMA. (E.) Sakurai, M. (Osaka U. Med. Sch., Japan) and T. Miyaji. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 127-135, 1973.

The Australia antigen (Au ag) was found in 26% of the cases of cirrhosis hepatoma in two Osaka hospitals and in 13% of the cases of cirrhosis without hepatoma. The incidence of Au ag was 57% among cases of cirrhosis with hepatoma in a Bangkok hospital and 20% among cases of cirrhosis without hepatoma. In Osaka, 5% of the cases of hepatoma with cirrhosis showed the Australia antibody, while it was present in none of the cirrhosis with hepatoma cases in Bangkok. Morphologically, active cirrhosis, involving positive lymphocytic infiltration, was Au ag negative in 13 out of 15 cases; inactive cirrhosis, involving negative lymphocytic infiltration, was Au ag positive in 7 out of 12 cases. Morphological Type B cirrhosis (septal or posthepatic type with narrow stroma and hypertrophied pseudonodules) with minimal lymphocytic infiltration showed a higher correlation with persistent positive Au ag. Thirty-three percent of the cases which were positive for alpha-fetoprotein were Au ag positive. (9 references)

- 6643 MAREK'S DISEASE: A POSSIBLE MODEL FOR HERPESVIRUS-INDUCED NEOPLASMS IN MAN. (E.) Payne, L. N. (Houghton Poultry Res. Station, Huntingdon, England). *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 235-257, 1973.

Marek's disease (MD) is the only common, naturally occurring lymphomatous disease caused by a Herpesvirus which is highly contagious. MD might serve as a useful experimental model for studying various human lymphoproliferative disorders, particularly infectious mononucleosis (IM), Burkitt's lymphoma (BL), and Hodgkin's disease (HD). The natural occurrence and comparative virology of MD are discussed and compared with those of IM, BL, and HD. Various patho-

logical findings suggest that MD has some features in common with each of these three human disorders and that it may be useful in indicating new approaches to the human diseases. Further, the factors which influence the incidence of MD in populations may have some bearing on the incidence of the less common human diseases. A number of host, viral, and environmental factors influence the epidemiology of MD: the genetic constitution of the host, the age of the host, the presence of maternal antibody against MD virus, the sex of the host, diet and growth rate, stress, the strain of MD virus involved, the viral dose, and vaccination or lack of it against MD. The significance of these factors in the epidemiology of the IM, BL, and HD are discussed. (133 references)

- 6644 STRATEGY FOR CANCER EPIDEMIOLOGY. (E.) Hirayama, T. (Nat'l. Cancer Ctr. Res. Inst., Tokyo, Japan). *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 393-420, 1973.

The strategy for the epidemiological study of cancer should involve the identification and control of derepressors and the identification and management of high-risk groups. Environmental carcinogenesis should be studied in terms of the effects of exposure to chemicals such as tobacco smoke, natural plants, fungal products, and chemical products; various viruses which may have a direct or indirect carcinogenic effect; and radiation. A system for the detection and surveillance of potential carcinogens such as these should be established as a network covering the whole community. The delineation of high-risk groups is of critical importance in determining the etiology and control of cancer. In particular, high-risk groups for childhood malignancies must be identified, with attention being given to factors such as maternal age, birth wt, and radiation exposure. A system of "at risk registry" should then be established when a reliable and practical detection method becomes available. Operational epidemiology, which is a hybrid of experimental epidemiology and operations research, should be utilized if cancer control and eradication are to be realized. The observation of changes in cancer incidence following unintentional environmental change is of greater value than the repetition of routine observations of cancer incidence. (30 references)

- 6645 ALPHA FETOPROTEIN: DETECTION, ISOLATION AND CHARACTERIZATION. (E.) Sarcione, E. J. (No affiliation). *Methods Cancer Res* 10:85-104, 1973.

Selection methods and techniques that have been applied to the detection, isolation, and characterization of alpha-fetoprotein in man and animals are reviewed. Detection methods include the production of antisera, double immunodiffusion, immunoelectrophoresis, countercurrent (crossover) immunoelectrophoresis, indirect radioimmunoautography, direct radioimmunoautoradiography, immunofluorescence, radial immunodiffusion, electrophoresis in antibody-containing media, aggregate-hemagglutination, radioimmunoassay, and electrophoresis. With regard to

characterization, microheterogeneity is given particular consideration. (62 references)

- 6646 CANCER OF THE THYROID. (E.) Stanbury, J. B. (No affiliation) and L. J. DeGroot. *Methods Cancer Res* 10:129-159, 1973.

Cancer of the thyroid is discussed in terms of etiological factors, biochemical abnormalities in human thyroid tumors, experimental thyroid cancer, medullary carcinoma of the thyroid, diagnostic methods, and treatment. Specific diagnostic techniques include clinical priorities, isotope scanning, fluorescence thyroid scanning, thermography, and ultrasonic echography. Etiological factors considered include environmental radiation, iodine, and inborn metabolic errors. (123 references)

- 6647 EXPERIMENTAL STUDIES ON THE EPIZOOTIOLOGY OF MAREK'S DISEASE. (E.) Kato, S. (Res. Inst. Microbial Dis., Osaka U., Japan). *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 259-267, 1973.

Seven variants of the Marek's disease virus (MDV) and the herpesvirus of turkey (HVT) with differing pathogenicities are described. All of these strains except one MDV variant lack oncogenicity in chickens, and three of the variants lacked infectivity in chickens. These data indicate that variation of MDV occurs rather easily and that the incidence of MD could at least partially depend upon the characteristics of MDV. Virus-induced cell surface antigens (CSA) have been found on cells infected with MDV and HVT. The CSA of HVT appears to be a newly synthesized protein coded by the parental viral genome. Since the CSA of HVT crossreacts with that of MDV, the characteristics of the former may reflect those of the later. CSA of MDV has been found to dissociate from viral antigen in the lymphoid cells of living chicks, suggesting that MDV may be intrinsically involved in chicken lymphoid cells. Convincing evidence exists implicating MDV in the etiology of Marek's disease. In Japan, three kinds of vaccines have been used to protect against this disease: a killed MDV vaccine; a live tissue culture attenuated virus; and a lyophilized HVT. The latter two have been especially successful when used as vaccines against MD. (29 references)

- 6648 MARKERS OF CARCINOGENIC PROCESS WITH SPECIAL REFERENCE TO ALPHA-FETOPROTEIN. (E.) Hirai, H. (Hokkaido U. Sch. Med., Sapporo, Japan) S. Nishi and H. Watabe. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 79-89, 1973.

Alpha-fetoprotein (AFP) has been detected in approximately 80% of African, Russian, English, and Japanese patients with histologically confirmed hepatoma; it has been found in about 50% of European and American hepatoma patients. There is no

difference in the amino acid composition of human fetal AFP and hepatoma AFP, but there are obvious differences between AFP and albumin. There are two types of hepatomas, which do not appear to differ morphologically: AFP producing and non-producing hepatomas. AFP is also produced in patients with hepatitis and cirrhosis. When rats were fed diets containing 4-dimethylaminoazobenzene (DAB), AFP appeared in their blood after 3 wk, reaching a maximum in the 7th wk and thereafter decreasing and disappearing; this transient early appearance of AFP is called the primary reaction. After the 11th wk, AFP again appeared and increased as hepatoma developed. The primary reaction seems to be a necessary condition for hepatoma development. AFP has also been shown to accompany the development of severe acute hepatitis in mice. Although the Australia (Au) antigen has been considered to be specifically associated with hepatitis, the antigen has been detected in about 50% of patients with hepatoma and/or cirrhosis. The prevalence of Au antigen in hepatoma patients positive for AFP appears to be higher than in hepatoma patients negative for AFP. Hepatitis in humans may correspond to the primary reaction in rats, so that primary liver cancer may be preventable or even curable. (11 references)

- 6649 THE RELATION OF PROLACTIN AND MAMMARY GLAND CARCINOGENESIS. (E.) Van der Gugten, A. A. (No affiliation) and A. A. Verstraeten. *Methods Cancer Res* 10:161-200, 1973.

A discussion of the relationship between prolactin and mammary gland carcinogenesis includes a section on the role of prolactin in vertebrates. Specific topics include a general survey of vertebrates, male mammals, female mammals, and primates, including man. Isolation procedures are considered in terms of starting material, the isolation of prolactin by means of direct extraction from crude homogenates of anterior pituitary glands, the isolation of prolactin from the "granular fraction" of pituitary tissue or transplanted pituitary tumors, and the isolation of human prolactin. Bioassays and biochemical assays for prolactin include the pigeon crop sac assay, lactogenic activity on mammary gland explants in organ culture, and a biochemical assay for prolactin. Radioimmunoassay is discussed with regard to the iodination procedure, antiserum titration curves, and competitive inhibition curves. Finally, under the role of prolactin in mammary gland carcinogenesis, consideration is given investigations into hormonal mammary gland carcinogenesis, DMBA-induced mammary tumors in Sprague-Dawley rats, and the human situation. (220 references)

- 6650 AUTOANTIBODIES IN MALIGNANT DISEASE. (E.) Fairly, G. H. (I.C.R.F. Dept. Med. Oncol., St. Bartholomew's Hosp., London, England). *Br J Haematol* 23:231-234, 1972.

Numerous antibodies and lymphoid cells directed against the malignant cells in patients with a variety of malignant diseases have been found. With

one exception, there is no evidence that immunization to augment any immunological reaction which may be present against the tumor cells is of any avail in the treatment of disseminated malignant disease. There is evidence that in the sera of many patients (up to 68%) with malignant disease a smooth muscle antibody (SMA) exists. SMA is also found in the sera of a smaller percentage of healthy subjects. Anti-nuclear factor (ANF) is also found in many cancer patients and is seldom found in healthy controls. In seven of 113 sera obtained from cancer patients a new IgG antibody was found. It gave a staining pattern similar to but distinguishable from SMA. The new antigen is evidently a component of normal human tissue and it may react with an antigen present in bile canaliculi. Other antibodies which have been described in malignant disease include an antibody directed at the cell membrane and a 'cytoplasmic' antibody. Further, the plasma of many cancer patients has been found to contain substances with the antigenic properties of fetal tissue. These substances include α -fetoprotein and carcinoembryonic antigen. (17 references)

- 6651 RETINOBLASTOMA. (E.) Cohan, M. (Parkway Gen. Hosp., N. Miami, Fla.) *Med Bull Naval Regl Med Ctr* 8(3):1-5, 1973. (11 references)

- 6652 THE PATHOLOGY OF CANCER OF THE BLADDER. AN EDITORIAL OVERVIEW. (E.) Pugh, R. C. B. (Inst. Urology, London, England). *Cancer* 32(5):1267-1274, 1973. (26 references)

- 6653 CARCINOMA OF THE PROSTATE: THE GREAT WIDOW-MAKER. (E.) Lattimer, J. K. (Coll. Phys. Surg., Columbia Univ., New York, N.Y.). *Med Coll Va Q* 9(3):240-244, 1973. (6 references)

- 6654 ENVIRONMENTAL NITROSAMINES. (E.) Anonymous. *Lancet* (7840):1243-1244, 1973. (35 references)

- 6655 THE NATURAL HISTORY OF PROSTATIC CANCER. (E.) Whitmore, W. F., Jr. (Mem. Sloan-Kettering Cancer Ctr., New York, N.Y.). *Cancer* 32(5):1104-1112, 1973. (101 references)

- 6656 IMMUNOLOGY AND GASTROINTESTINAL CANCER. (E.) Segal, H. L. (Univ. Rochester Sch. Med., N.Y.). *NY State J Med* 73(22):2662-2664, 1973. (13 references)

- 6657 TESTICULAR TUMORS IN INFANTS AND CHILDREN. (E.) Smith, J. P. (Children's Hosp., Columbus, Ohio). *Urology* 11(4):353-360, 1973. (18 references)

- 6658 MALIGNANT MELANOMA: A SELECTIVE REVIEW OF THE BIOLOGY, HISTOCHEMISTRY, AND DIAGNOSTIC CYTOLOGY. (E.) Edelstein, L. M. (St. Vincent Hosp., Worcester, Mass.), J. W. Jhung, R. W. Bain, S. Hanscom, N. Cariglia and C. Brookman. *Am J Med Technol* 39(10):373-378, 1973. (36 references)
- 6659 POLYSACCHARIDES IN CANCER: GLYCO-PROTEINS AND GLYCOLIPIDS. (E.) Nigam, V. N. (Inst. Cancer, Montreal, Canada) and A. Cantero. *Adv Cancer Res* 17:1-80, 1973. (325 references)
- 6660 RECENT CHANGES IN THE CANCER FREQUENCY IN THREE REGISTRY REGIONS IN THE NETHERLANDS. (Dut.) Harmse, N. S. (Dept. Clin. Documentation Cancer Registry, Queen Wilhelmina Fdn., Amsterdam, Netherlands) and F. de Waard. *Tijdschr Soc Geneeskde* 51(20):670-679, 1973. (8 references)
- 6661 GENETIC EXPRESSION AND ITS REGULATION OF VIRUSES IN EUKARYOTIC CELLS. (Fr.) Monier, R. (Inst. Sci. Res. Cancer, Villejuif, France). *Biomedicine* 18(6):441-445, 1973. (28 references)
- 6662 ENVIRONMENT OF THE BLOOD-BORNE TUMOR EMBOLUS ADHERENT TO VESSEL WALL. (E.) Warren, B. A. (Dept. Pathol., U. Western Ontario, London). *J Med* 4:150-177, 1973. (59 references)
- 6663 PRIMARY TUMORS OF THE THORACIC WALL. REVIEW. (Fr.) Mercier, R. (Fac. Med. Clermont-Ferrand, France) and G. Vanneuvillie. *Poumon Coeur* 28(9-10):465-480, 1972. (No references)
- 6664 FREE RADICALS AND TOXICOLOGY. (Fr.) Fournier, E. (Fac. Med. Lariboisiere-St. Louis, U. Paris, France). *J Eur Toxicol* 6(3):109-122, 1973. (26 references)
- 6665 PROLACTIN CELL TUMORS IN ANIMAL EXPERIMENTS AND IN MAN. (Ger.) El Etreby, M. F. (Schering Res. Lab., Berlin/Bergkamen, Germany) and P. Gunzel. *Arzneim Forsch* 23(12):1768-1790, 1973. (249 references)
- 6666 RNA VIRUSES AS CAUSES OF CANCER. (Ger.) Balda, B. R. (Dermatol. Clin., U. Munich, Germany). *Dtsch Med Wochenschr* 98(51):2452-2454, 1973. (29 references)
- 6667 MELANOAMELOBLASTOMA — REPORT OF A CASE AND REVIEW OF LITERATURE. (E.) Harilal, K. R. (Dept. Pathol. Pediatr. Surg., Med. Coll., Trivandrum, India), K. K. Varma and R. J. Groover. *Indian J Cancer* 10(2):234-238, 1973. (28 references)
- 6668 SOME RECENT ADVANCES IN THE STUDY OF METASTASIS. (It.) Carter, R. L. (Chester Beatty Res. Inst., London, England). *Recent Prog Med (Roma)* 54(5):404-421, 1973. (21 references)
- 6669 PRESENT VIEWS ABOUT RELATIONS BETWEEN ULCER AND CANCER OF THE STOMACH. (It.) Jori, G. P. (Inst. Pathol., Naples, Italy) and C. Peschle. *Recent Prog Med (Roma)* 54(5):460-482, 1973. (84 references)
- 6670 IMMUNITY AND TUMORS. IMMUNOLOGIC DIAGNOSIS OF ONCOFETAL ANTIGENIC TUMORS. (It.) Dammacco, F. (Inst. Med., U. Bari, Italy) and A. Miglietta. *Recent Prog Med (Roma)* 54(5):396-403, 1973. (44 references)
- 6671 ACUTE LEUKEMIA: SYNDROME OR DISEASE? (Fr.) Varet, B. (Cochin Hosp., Paris, France) and G. Flandrin. *Rev Praticien* 23(3):177-182, 1973. (10 references)

- 6672 ALKYLATION OF PORCINE NUCLEIC ACIDS FOLLOWING INTRAVENOUS AND INTRAGASTRIC APPLICATION OF *N*-METHYL-*N*-NITROSOUREA. (E.) Kleihues, P. (Max-Planck Inst. Brain Res., Cologne, W. Germany), D. Stavrou, E. Scharrer and J. Bücheler. *Z Krebsforsch* 80(4):317-322, 1973.

Alkylation of nucleic acids was measured 3 hr after the administration of *N*-(¹⁴C)-methyl-*N*-nitrosourea (MNU, 10 mg/kg) to Hanford mini pigs. After intravenous injection the amount of 7-methylguanine formed in DNA and RNA of liver, kidney, intestines, and brain, was 2-3 times higher than after administration of a similar dose by stomach tube. In the stomach, however, the level of alkylation was more than 8 times higher after intragastric application when compared to intravenous injection. *In vitro* studies on the stability of MNU in gastric juice indicate that no significant decomposition of the carcinogen occurred within the gastric lumen in a 1 hr period. These results suggest that, after application by stomach tube, a substantial proportion of MNU reacts with stomach cells during resorption without entering systemic circulation. In light of these results, the fact that Hanford mini pigs received MNU via stomach tube in bi-weekly intervals for over 4 yr without developing tumors in any organ suggests that MNU is either not carcinogenic in Hanford mini pigs, or that the induction time of tumors is related to the expected life time of the species.

- 6673 AFLATOXINS: EPIDEMIOLOGICAL STUDY ON CARCINOGENICITY AT CHRONIC LOW-LEVEL EXPOSURE IN A FACTORY POPULATION. (Dut.) van Nieuwenhuize, J. P. (Occupational Hlth. Service, Zaandam, The Netherlands), R. F. M. Herber, A. de Bruin, I. P. B. Meyer and W. C. Duba. *Tijdschr Soc Geneesk* 51(22):754-760, 1973.

A prospective study was made of 67 workers in a mill producing peanut and flaxseed oils. These workers were exposed for 2 to 9 yr to small dust particles containing aflatoxins from the peanuts. During an 11-yr observation period, 11 oil workers developed various forms of cancer and two died of liver diseases. Cancers consisted of four cases of bronchial carcinoma and one case each of carcinoma of the liver, prostate, gastrointestinal tract, bladder, and maxillary sinus; a reticulum cell carcinoma or anaplastic carcinoma involving the cervical lymph nodes; and a pleural mesothelioma. A 58-yr-old man died of bleeding esophageal varices; autopsy showed hepatitis associated with cirrhosis. Another oil worker died of hepatorenal syndrome with possible hepatitis. These 13 workers belonged to a group of 55 workers who were over 39-yr-old at the beginning of exposure. They were exposed to total doses of aflatoxins estimated to range from 160 to 395 µg. A comparison was made with a group of 55 age-matched controls who worked with plant raw materials, had similar work hours, and lived in the same villages as the vegetable oil workers at the beginning of the observation period. Only four of the 55 controls developed cancer (2 cases of bronchial carcinoma and one each of stomach and prostate cancer) and none

had liver disease. No aflatoxins were found in 120-hr urine specimens taken from two vegetable oil workers who were estimated to be exposed to a maximum of 3 µg aflatoxin during this period.

- 6674 COMBINED ENZYME HISTOCHEMICAL AND RADIO-AUTOGRAPHIC STUDIES ON AREAS OF HYPERPLASIA IN THE LIVER OF RATS FED *N*-2-FLUORENYLACETAMIDE. (E.) Kitagawa, T. (Cancer Inst., Tokyo, Japan) and H. Sugano. *Cancer Res* 33(11):2993-3001, 1973.

By applying a unique combination of enzyme histochemistry and radioautography, sequential changes of hyperplastic areas in the livers of rats fed a diet containing 0.03% *N*-2-fluorenylacetamide were examined. In the 9th wk, the areas of hyperplasia showed marked β-glucuronidase, glucose 6-phosphatase, and canalicular adenosine triphosphatase deficiencies; they were selectively and intensely labeled 18 to 27 hr after two-thirds hepatectomy by repeated injections of tritiated thymidine, 400 µCi/rat. In the successive combined histochemical and radioautographic studies, most of the labeled hyperplastic areas became comparable to the normal adult liver both in the enzyme level and localization within 9 wk after labeling. Thus the regenerative character of most of these areas was confirmed. On the other hand, minor areas of hyperplasia remained enzyme deficient or were characterized by unusual intracellular localization of enzyme activity. These enzyme-deficient areas increased in size during the observation period and were considered most significant as precancerous lesions. However, no labeled cells were observed radioautographically in overt carcinomas, even in the earliest microscopical ones. Further modification of this method of investigation is necessary to determine the precancerous nature of these persistently enzyme-deficient areas of hyperplasia.

- 6675 ENDOTOXIN INDUCED SHORTENING OF S-PHASE DURATION IN MESOTHELIAL CELLS. (E.) Mohr, W. (Ctr. Biol. Theoretical Med., U. Ulm, Germany), M. Kesenheimer and G. Beneke. *Beitr Pathol* 150(4):412-415, 1973.

Endotoxin (100 µg/rat, i.p.) was given to male SIV 50-rats. H³-thymidine (80 µg/rat, specific activity: 5 ci/mMol, i.m.) was given 48 hr later. In untreated controls, labeled cells and mitoses were rare. The first labeled mitoses appeared after 3 hr, 100% labeling of mitoses was attained at 5 hr. The rate of labeled mitoses decreased after 14 hr. In endotoxin treated animals, labeled cells and mitoses were frequently seen. The first labeled mitoses were seen 2 hr after H³-thymidine injection, with 100% labeling reached after 4 hr. The rate of labeled mitoses decreased after 10 hr. The time-curves of percent labeled mitoses in mesothelial cells of control and experimental animals show no variation in the G₂-phase duration, while S-phase duration is 3.6 hr shorter in mesothelial cells of endotoxin treated animals compared to untreated controls. These results suggest that mature connective

tissue cells may undergo transformation into more immature cells under experimental conditions. These immature connective cells can be characterized by a high rate of proliferation and a shortening of S-phase duration. It is also possible that hyaluronic-acid like immature connective tissue cells may be produced.

6676 CYTOGENETIC STUDIES IN CHRONIC BENZENE EXPOSURE. (Ger.) Khan, H. (Ctr. Internal Med., Johann Wolfgang Goethe U., Frankfurt/Main, Germany) and M. H. Khan. *Arch Toxicol* 31(1):39-49, 1973.

Cytogenetic studies were performed on peripheral blood cultures from 15 workers exposed to benzene and 14 controls from the same factory. In addition, the bone marrow technique was used on four of these benzene workers and on two controls. Workers exposed to benzene were divided into two groups: (1) seven subjects with exposure times of 11 to 20 yr (mean 14 yr) and (2) eight subjects with exposure times ranging from two to five yr (mean four yr). The mean age of benzene workers was 41 yr and that of controls 37 yr. In peripheral blood cultures, chromatid aberrations (gaps, erosions, breaks) and isochromatid aberrations were found in 18.2% of the mitoses in group (1), in 15.0% of those in group (2), and in 13.2% of those in the control group. No difference was found in the percentage of unstable chromosome aberrations in groups (1) and (2), but these aberrations were significantly more common among benzene workers than among controls (0.9). The percentage of tetraploid mitoses was about the same in benzene workers and controls. Stable chromosome aberrations occurred significantly more often in benzene workers (2.3%) than in controls (0.2%). More chromatid (18.5%) and chromosome (12.9%) aberrations occurred in the bone marrow of benzene workers than in that of controls (12.7% and 1.8%, resp.), but the number of mitoses examined was so small that these differences must be carefully evaluated. No qualitative differences were found between aberrations in subjects in group (1) and those in group (2), confirming that individual predisposition is more important than exposure time. Of the 15 benzene workers examined, one had benzene myelopathy. In this case chromatid aberrations were present in 30% and chromosome aberrations in 14% of the mitoses in peripheral blood cultures. In most cases, his bone marrow metaphases contained blurred, sticky chromosomes with chromatin bridges and fragments. Of seven metaphases examined, four contained an acentric fragment and one, a short-arm deletion of a C group chromosome.

6677 HORMONAL IMPLICATION IN INITIATION AND PROGRESSION OF EXPERIMENTAL MAMMARY TUMORS IN THE RAT. (E.) Takizawa, S. (Res. Inst. Nuclear Med., Hiroshima U., Japan). *Acta Pathol Jap* 23(4):683-693, 1973.

Ovariectomy at any stage completely inhibited the mammary tumorigenic action of N-nitrosobutylurea (NBU) in female Wistar/Furth rats. Furthermore,

a supplement with mammotropic pituitary hormone (Mth) by the grafting of a transplantable mammotropic pituitary tumor in the ovariectomized rats was not effective in restoration of mammary tumor (MT) development. However, growth of the established MT was not much affected by subsequent ovariectomy, if Mth was sufficiently supplied. It was suggested that both ovarian hormones and Mth act synergistically in the stage of "initiation" and Mth plays a role superior to the ovarian hormones in the stage of "progression" of mammary tumorigenesis with NBU. NBU and 7,12-dimethylbenz(a)anthracene (DMBA) were compared with respect to mammary tumorigenic action. Using NBU, the doses of 2.5 mg/day for 6 months or 5 mg/day for 3 months were effective in producing MT in most susceptible rats. On the contrary, 10 mg/day was apparently deleterious for MT production, possibly due to suppressed gonadal function of the hosts by a toxic dose of the carcinogen. A single dose of 20 mg of DMBA was more effective in producing MT than a continuous administration of NBU in terms of both the number of tumors per rat and the period of latency. By fractionated application of DMBA, tumor productivity was markedly augmented, yielding 100% tumor development in 3-4 months. It was also found that NBU-induced MT were less hormone responsive and less antigenic as compared to the MT induced with DMBA.

6678 ENDOGENOUS NITROSATION OF N-ALKYLUREAS AND N-ALKYLCARBOXYLIC ACID AMIDES AS TERATOGENIC FACTOR IN RATS AND MICE. (Ger.) Hafen, P. (Northwest German Jaw Clin., U. Hamburg, Germany), V. Koblitz, R. Atzeroth and T. von Kreybig. *Z Krebsforsch* 80(4):269-276, 1973.

Pregnant NMRI-Han. mice were given 0.50% or 0.75% sodium nitrite in their drinking water from days 9 to 12 of gestation with a single i.p. or s.c. injection of an N-alkylurea or an N-alkylcarboxylic acid amide on day 11. Combination of 0.5% or 0.75% sodium nitrite with N-methylurea (1000 mg/kg) produced characteristic malformations in two-thirds of the surviving fetuses. These malformations included brachygnathia, cleft palate, and anomalies of the extremities. Only 10% of the surviving fetuses had cleft palates and 20% had developmental retardation when their mothers were given 0.5% sodium nitrite and N-methylformamide (200 mg/kg). All surviving fetuses were normal when their mothers received 0.75% sodium nitrite and N-methylacetamide (1000 mg/kg). Pregnant CD rats were given the same concentrations of sodium nitrite in their drinking water on days 11 to 15 of gestation and a single i.p. or s.c. injection of an N-alkylurea or an N-alkylcarboxylic acid amide on day 13. Malformations were found in all fetuses whose mothers had received 0.75 sodium nitrite and N-methylurea (1000 mg/kg). In addition to the malformations described above in mice, these compounds caused blood-filled mesenchymal cysts on the wall of the nose, cysts which arched from the base of the tongue to the nostrils, and short kinky tails in rat fetuses. When their mothers received 0.75% sodium nitrite and N, N¹-dimethylurea, more than half of the rat fetuses had characteristic malformations (brachygnathia,

cleft palates, ectrodactylia of both extremities, and kinky tails). Similar observations were made in fetuses whose mothers had been given 0.75% sodium nitrite and trimethylurea (500 mg/kg). The fetal death rate was very high with both dimethyl and trimethylurea. When sodium nitrite and N-methylformamide (250 mg/kg) were administered to pregnant rats, 90% of the fetuses developed normally; the remaining 10% had meningoceles and kinky tails. Administration of 0.75% sodium nitrite and a larger dose of N-methylformamide (500 mg/kg) had a much more pronounced teratogenic effect. Surviving fetuses had cranial aplasia, ventricular bleeding in deformed brains, brachygnathia, cleft palates, and ectrodactylia. Most fetuses obtained from mothers given 0.75% sodium nitrite and N-methylpropionamide died shortly after treatment; all six survivors had developmental retardation but were not malformed.

6679 CARCINOMA OF THE RENAL PELVIS AND ITS RELATIONSHIP TO ANALGESIC ABUSE. (E.)

Juusela, H. (U. Central Hosp., Helsinki, Finland). *Ann Chir Gynaecol Fenn* 62(6):386-390, 1973.

A clinical series of 17 patients (11 males and 6 females; aged 36-80 yr) with renal pelvic carcinoma was studied. Macroscopic hematuria was the most common presenting symptom, and it was the only symptom in many of these 17 cases. Urography and exfoliative cytology were the most important tools in diagnosis. The treatment was nephroureterectomy in 11 cases, radical nephrectomy in 3, and resection of the renal pelvis in 2. Two of the patients received postoperative irradiation for lymphatic extension of the tumor. The follow-up time was 1-5 yr. Six of the patients died during the observation time. In two of these metastases was certain, one to the bone and the other, pulmonary. Of the remaining 11 cases, 7 are alive and well, 2 have papillomatous tumors in the urinary bladder and an additional 2 have a strong suspicion of a pelvic tumor in the contralateral kidney. In this group, three patients with definite abuse of analgesics containing phenacetin (4 or more tablets/day over 10 yr) and two possible abusers were found, indicating a possible factor in the etiology of pelvic carcinoma. However, it is noted that patients who did demonstrate analgesic abuse had significantly elevated blood pressures in contrast to normal readings in all other patients.

6680 CLASSIFICATION OF INITIAL LEUKEMIC CHANGES IN RATS FED N,N'-2,7-FLUORENYLENEBISACETAMIDE. (E.) Takayama, S. (Tokyo Med. Dent. U., Japan) and S. Kamata. *Acta Pathol Jap* 23(4):755-768, 1973.

Leukemia was induced in 96 (44%) of 216 male and female Wistar rats which were fed a diet containing 0.025% N,N'-2,7-fluorenylenebisacetamide. This leukemia developed from a solitary lesion to a scattered and further a diffuse lesion. Transitional figures were seen from solitary to scattered and further diffuse lesions. The appearance of orthochromatic erythroblasts in the peripheral

blood was utilized for detection of solitary lesions. Almost all bones of the body were examined histologically. The classification of leukemia was performed from diffuse lesions toward scattered and solitary lesions. Solitary lesions were classified into mature granulocytic, erythroblastic, micromyeloblastic, and unclassified types. No solitary lesion of myeloblastic type was identified. Each type showed its particular histological pattern from the initial stage, though solitary lesions were composed of more immature cells than those of scattered and diffuse lesions. The nodular foci of solitary lesions and the very much larger foci of scattered lesions are considered to be the primary site of each type of leukemia, and they are located mainly in the bone marrow. The nodular foci of mature granulocytic leukemia appears more in short and flat bones, and those of erythroblastic leukemia, in the shaft of long bones. The spleen is the site of predilection for micromyeloblastic leukemia.

6681 CHANGES IN CARBOHYDRATE METABOLISM IN THE RAT KIDNEY DURING SENSITIZATION WITH DIMETHYLNITROSAMINE. (Rus.) Beliaeva, N. M. (Orenburg Med. Inst., USSR). *Vopr Onkol* 19(12):47-51, 1973.

Dimethylnitrosamine (DMNA) was administered to non-inbred albino rats in doses of 10 mg/kg in 1.0 ml water p.o. through a stomach tube. Rats were divided into four groups: (1) received five sensitizing doses of DMNA followed by an 8-wk interval and then five challenge doses, (2) received five doses, (3) received ten doses administered continuously with no break, and (4) received no treatment. During the eight-month observation period, kidney tumors developed in 76% of the rats in group (1) and in 42% of those in groups (2) and (3). Two rats in group (3) also had primary hepatomas. Rats in group (1) began to develop kidney tumors after 17 wk, while the first tumors appeared after 27 and 28 wk, resp. in groups (2) and (3). Kidney tumors consisted of two types: (1) papillary or tubular adenomas or adenocarcinomas and (2) undifferentiated tumors. These two types of tumors occurred in about the same percentage of rats. One undifferentiated tumor metastasized into a lung and another into the liver. Changes in carbohydrate metabolism in the renal cortex of kidneys without gross evidence of tumors were similar in all three groups of rats given DMNA. The hexokinase activity and the rate of anaerobic glycolysis were increased, while glucose-6-phosphatase activity was decreased. These changes were most pronounced in rats belonging to group (1). Lactate dehydrogenase activity was increased only in the kidneys of rats from group (1).

6682 DISTURBANCE OF IMMUNE SYSTEM IN MICE BY ADMINISTRATION OF 7,12-DIMETHYLBENZ[a]ANTHRACENE AND NORMAL THYMOCYTES. (E.) Matsuoka, Y. (Osaka U. Med. Sch., Japan), J. Fujiwara, H. Senoh and M. Kitagawa. *Gann* 64(6):575-581, 1973.

Mice given 7,12-dimethylbenz[a]anthracene (DMBA)

(1.0 mg) simultaneously with immunization with bacterial α -amylase (BaA) showed an augmented anti-BaA response in sera as compared with mice given only BaA, but the development of immunological memory in DMBA-treated mice was constantly and persistently depressed. Administration of syngeneic normal thymocytes to DMBA-treated mice further strengthened the augmenting effect of DMBA on the serum antibody titers, whereas administration of thymocytes to normal mice not treated with DMBA revealed a rather suppressive effect on the serum antibody titers. Most of the mice given both DMBA and normal thymocytes suffered from a variety of wasting symptoms resembling those of runt disease or graft-versus-host reaction, and many of them died within 4 to 5 weeks. Histological examination showed almost complete loss of follicular organization in spleen and lymph nodes. A similar but slight histological change was observed in mice given only DMBA. These findings suggest that the immune system of mice was markedly disturbed not only by the direct effect of DMBA, but also by the secondary reactions of immune competent cells, thymocytes or their progeny T cells, against self-constituents under specific conditions induced by DMBA.

6683 *IN VITRO* TRANSFORMATION OF SUBMANDIBULAR GLAND EPITHELIAL CELLS AND FIBROBLASTS OF ADULT RATS BY METHYLCHOLANTHRENE. (E.) Brown, A. M. (U. Pennsylvania Sch. Dental Med., Philadelphia, Pa.). *Cancer Res* 33(11):2779-2789, 1973.

Rat salivary gland epithelial cell cultures were initiated and maintained by the avoidance of trypsin in the early passages. These cells and fibroblasts were treated with 3-methylcholanthrene and 7,12-dimethylbenzanthracene according to established protocols. The epithelial cell lines were remarkably susceptible to the toxicity of the hydrocarbons for their first 15 to 20 passages. After the 20th passage, the epithelial cells were better able to survive hydrocarbon toxicity and were capable of being subcultured. Ten to 12 wk after treatment, epithelial lines and fibroblasts showed increased growth rate and piling up in culture. They produced tumors upon inoculation into syngeneic weanling hosts. These tumors were transplantable and showed clear-cut carcinomatous or sarcomatous morphology. To date, 18 months after the start of the study, no evidence of transformation of untreated or dimethyl sulfoxide-treated control cells has been seen in either fibroblast or epithelial lines.

6684 SUPPRESSIVE EFFECT OF CONCURRENT ADMINISTRATION OF METAL SALTS ON CARCINOGENESIS BY 3'-METHYL-4-(DIMETHYLAMINO)AZOBENZENE, AND THE EFFECT OF THESE METALS ON AMINOAZO DYE METABOLISM DURING CARCINOGENESIS. (E.) Yamane, Y. (Fac. Pharm. Sci., Chiba U., Japan) and K. Sakai. *Gann* 64(6):563-573, 1973.

Effect of the concurrent administration of salts of heavy metals such as copper, manganese, zinc,

and nickel, in suppressing hepatocarcinogenesis of 3'-methyl-4-(dimethylamino)azobenzene (3'-Me-DAB) in rats was examined. To find the mechanism of this suppression, the effect of these metal salts on the formation of protein-bound dye in the liver and the hepatic activity to metabolize 4-(dimethylamino)azobenzene (DAB) was examined. Carcinogenesis of 3'-Me-DAB was inhibited markedly by a copper salt and to a lesser degree by manganese and nickel salts. No such effect was observed with the zinc salt. The effect of these metal salts in suppressing azo-dye carcinogenesis seemed to parallel their capacity to reduce the hepatic level of protein-bound dye and to enhance the hepatic azo reductase activity. No correlation was found between this suppressive effect of these metal salts and their effect on other enzymic activities related to aminoazo dye metabolism such as ring hydroxylation and oxidative N-demethylation. The present results indicate that the increased azo reductase activity in the rat liver by the concurrent administration of copper and other salts results in narrowing of other metabolic routes related to the metabolic activation of the dye which is responsible for the carcinogen binding to proteins and henceforth to hepatocarcinogenesis.

6685 THE CONTENT OF THE PRINCIPAL PROTEIN TARGET OF A HEPATIC CARCINOGEN IN LIVER TUMORS. (E.) Mott, D. M. (Inst. Cancer Res., Philadelphia, Pa.), B. P. Sani and S. Sorof. *Cancer Res* 33(11):2721-2725, 1973.

Specific antiserum against the principal liver protein target of a hepatic azocarcinogen was obtained by immunization with the highly purified liver azoprotein isolated from rats fed 3'-methyl-4-(dimethylamino)azobenzene for 15 to 18 days. The amount of the target protein in serially diluted liver and liver tumor cytosols was measured by gel double immunodiffusion with a precision of 10% (S.D.) or less. Little difference in the relative content of the principal target protein was found in the liver cytosols of normal rats and those fed a diet containing or lacking the azocarcinogen. In contrast, in 15 cytosols of primary liver tumors from 15 rats fed the azocarcinogen until sacrifice, the content of the azocarcinogen protein target was 6 to 31% (average, $18 \pm 8\%$ S.D.) of that present in normal rat liver cytosol. In 7 cytosols from liver tissue surrounding the tumors, the quantity of target protein was 66 to 116% (average, $83 \pm 19\%$ S.D.). An additional series of assays examined four types of transplanted hepatomas that were originally induced by fluorenyl amide and biphenyl amide carcinogens. These carcinogens probably have principal target proteins that are different from those of azocarcinogens. Three kinds of well-differentiated hepatomas had mean levels (85 to 98%) of the protein target of azocarcinogens similar to that of normal liver. One type of poorly differentiated hepatoma had < 3%. The finding of a reduction in amount of principal protein target of a carcinogen in primary tumors caused by that carcinogen, and not in transplanted differentiated tumors caused by other

carcinogens, suggests two alternatives: either the reduction need be specifically that of the target protein of the carcinogen which caused the neoplasm or it is due to other causes, e.g., tumor progression, and therefore is not essential for neoplasia *per se*.

- 6686 STRAND BREAKAGE IN RAT LIVER DNA AND ITS REPAIR FOLLOWING ADMINISTRATION OF CYCLIC NITROSAMINES. (E.) Stewart, B. W. (Temple U. Sch. Med., Philadelphia, Pa.) and E. Farber. *Cancer Res* 33(12):3209-3215, 1973.

Sedimentation of hepatic DNA in neutral and alkaline sucrose gradients was used to detect double- and single-strand "breaks," resp., following administration of the hepatocarcinogens nitrosomorpholine, nitrosopiperidine, and dinitrosopiperazine to male Wistar rats. With each compound, the relationship between initial damage to DNA and dose and the time course of restoration of high-molecular-wt DNA ("repair") were established. Changes in the velocity sedimentation of DNA prepared 4 hr after administration of from 1 to 100 mg/kg body wt nitrosomorpholine were observed in both alkaline and neutral sucrose gradients. The single-strand damage to DNA was not completely repaired 14 days after treatment while the double-strand breaks were more rapidly repaired. Injection of similar doses of either of the other two cyclic compounds also caused single-strand breaks in liver DNA which required at least 6 days for repair. These compounds had no effect on the velocity sedimentation of DNA on neutral sucrose gradients. High doses of the respective parent cyclic amines morpholine, piperidine, and piperazine, did not cause strand breaks in DNA. The data indicate that the cyclic nitrosamines examined may be metabolized by rat liver with the formation of species capable of alkylating DNA.

- 6687 THE EFFECT OF PLOIDY ON CHEMICAL MUTAGENESIS IN CULTURED CHINESE HAMSTER CELLS. (E.) Chasin, L. A. (Dept. Biol. Sci., Columbia U., New York City). *J Cell Physiol* 82(2):299-308, 1973.

Two strains of cells (one pseudodiploid and one tetraploid) derived from the Chinese hamster line CHO-K1 were cultured in monolayers and exposed to ethyl methane sulfonate for 18 hr. The exposed cells were repeatedly trypsinized and given a 7 to 8 day period to allow expression of the mutant phenotype. The cells resistant to 6-thioguanine were selected from these cells and cultured, as were glycine-independent cells. While both of these variant cell types normally occur only rarely, ethyl methane sulfonate treatment resulted in a dramatic increase in their frequency of occurrence. The frequency of reverse mutations from glucine auxotrophy to glycine independence was similar in the two original cell strains, as was expected for a dominant phenotype. However, forward mutation to 6-thioguanine resistance was 25-fold higher in the diploid as compared with the tetraploid strain. The resistant mutants lacked hypoxanthine phosphoribosyl transferase activity and their resis-

tant phenotype was recessive in somatic cell hybrids. A combination of chromosomal segregation and mutation could account for the frequency of these recessive drug-resistant mutants in the tetraploid population.

- 6688 INHIBITION OF THE DEVELOPMENT OF 3-METHYLCHOLANTHRENE-INDUCED MOUSE TUMOR WITH THE YEAST MANNAN PREPARATION. (E.) Kumano, N. (Res. Inst. Tuberculosis, Leprosy Cancer, Tohoku U., Japan), K. Kurita and S. Oka. *Gann* 64(5):529-533, 1973.

Male ddI mice were given 10 daily i.p. injections of a yeast polysaccharide solution, after which 3-methylcholanthrene was applied to their skin on 20 separate occasions at a rate of 3 times weekly. Visible papillomatous nodules appeared on 11 of the 20 yeast mannan treated animals and 12 of the 20 untreated animals; 10 of the tumors on the untreated mice and 2 of the tumors on the treated mice were malignant. The nodules completely regressed in six of the treated mice and in one of the untreated mice. The nonregressing tumors in the untreated mice grew progressively to reach an average diameter of 8.6 mm, while those in the treated mice grew slowly to reach an average diameter of 2.0 mm. No visible metastases were found in any of the treated or untreated mice.

- 6689 THYMIDYLATE SYNTHETASE ACTIVITY DURING THE INITIAL GROWTH PHASES OF *PSEUDOMONAS FLUORESCENS* UK-1. EFFECTS OF SOME CARCINOGENS ON THE ENZYME ACTIVITY. (E.) Soini, J. (Dept. Biochem., U. Turku, Finland) and K. Majasaari. *Suom Kemistilehti* 46(10):272-280, 1973.

The influence of the carcinogens, 3,4-benzo(a)pyrene, o-toluidine, diethylnitrosamine (DENA), 4-dimethyl-4-methylazobenzene (DMA), 4-dimethylamino-2'-methylazobenzene (DAMA), and dimethylaminoazobenzene (DAB), on the activity of thymidylate synthetase, an essential enzyme in DNA synthesis, and on the growth of *Pseudomonas fluorescens* UK-1 was examined. The enzyme activity was found to be at its highest at the beginning of growth and reached a minimum level during early exponential phase. Benzopyrene and DNA increased the activity at the outset of growth but their effects were negligible when the enzyme activity was at a minimum. o-Toluidine and DENA decreased the activity, whereas DAMA and DAB had no effect. The mode of action of chemical carcinogens on bacteria is so poorly known that no conclusions were drawn on the basis of these results.

- 6690 INDUCTION OF RAT MAMMARY ADENOMAS WITH THE RESPIRATORY INHIBITORY ROTENONE. (E.) Gosalvez, M. (Puerta de Hierro Clinic, U. Autonoma, Madrid, Spain) and J. Merchan. *Cancer Res* 33(11):3047-3050, 1973.

Four groups of 10 female albino rats were injected i.p. with rotenone daily for 42 days. Ten to 20% of the animals in each group died of acute

peritonitis, while 60 to 100% of the rats in each group developed mammary tumors. Of eight such tumors examined in detail, seven were mammary adenomas and one was a differentiated adenocarcinoma. All tumors were encapsulated and none showed metastasis. None of the tumor-bearing animals sustained liver or endocrine gland damage. Electron microscopy revealed a gradation of mitochondrial lesions in the tumor tissue. All rotenone-induced tumors lacked respiration with glutamate, malate, and other NADH-linked substrates: similarly, all rotenone tumors failed to show respiration with NADH and two failed to show respiration with succinate. A reasonably high level of cytochrome oxidase was present in the mitochondria of all rotenone tumors. The mitochondrial deficiencies exhibited by the rotenone mammary tumors are not seen in spontaneous mammary adenomas.

6691 STIMULATION OF DNA SYNTHESIS AND 2-DEOXY-D-GLUCOSE TRANSPORT IN CHICK EMBRYO CULTURES BY EXCESSIVE METAL CONCENTRATIONS AND BY A CARCINOGENIC HYDROCARBON. (E.) Rubin, H. (Dept. Molecular Biol., U. California, Berkeley) and T. Koide. *J Cell Physiol* 81:387-396, 1973.

DNA synthesis in serum-deprived chick embryo cultures is stimulated as much as ten-fold by the addition of Zn^{++} , Mn^{++} or Cd^{++} in concentrations just below the toxic level. These metals, in the same concentration range, also stimulate the uptake of 3H -2-deoxy-D-glucose (2-DOG). The increase in uptake of 2-DOG is proportional to and precedes the increase in synthesis of DNA, and is probably an indicator of a more general membrane perturbation. The metals also stimulate DNA synthesis in serum-containing, density-inhibited cultures. The carcinogenic hydrocarbon 9,10-dimethyl-1,2-benzanthracene stimulates DNA synthesis and 2-DOG uptake in serum-deprived cultures at those concentrations which also cause morphological changes in the culture. Other carcinogenic hydrocarbons, which produce no morphological changes in the culture do not stimulate DNA synthesis. In contrast to these non-specific effects, DNA synthesis which is inhibited by low concentrations of either ethylene diamine tetraacetate (EDTA) or diethylene triamine pentaacetate (DTPA) is stimulated specifically by Zn^{++} . These findings are interpreted to mean that certain metals and carcinogens, like a variety of other agents, interact non-specifically with the plasma membrane to initiate a chain of events leading to DNA synthesis. Since in every case, DNA synthesis follows and is proportional to glucose transport, it is suggested that glucose catabolism ultimately controls DNA synthesis.

6692 THE USE OF COUNTER-CURRENT DISTRIBUTION TO EXAMINE THE EFFECT OF DAMAGING AGENTS ON DNA. (E.) Jeney, A. (Christy Hosp., Withington, Manchester, Great Britain) and B. W. Fox. *Chem Biol Interact* 7(5):265-275, 1973.

The potentialities of the counter-current distribution system to study the secondary structure of mammalian DNA (rat tissue, Yoshida tumor, and lym-

phoma cells) after heat denaturation and treatment with alkylating agents was investigated. Alkylating agents used were nitrogen mustard, methylene dimethanesulphonate (MDMS), and dibromodulcitol. In these experiments, DNA was first treated *in vitro* with the alkylating agent and then denatured. Counter-current distribution proved to be a very sensitive method for demonstrating cross-linkage in DNA after treatment with very low concentrations of nitrogen mustard. After MDMS treatment, however, no similar effect on DNA could be observed. However, MDMS treatment *in vitro* altered the counter-current distribution of newly synthesized native DNA, that is, DNA labeled for a period corresponding to 5% of the doubling time of the cell line. The fact that this effect on DNA could not be demonstrated after *in vivo* treatment may be explained as follows. If the drug had preferentially acted on those cells which had previously incorporated the labeled precursors, that is cells of the active growing fraction of the tumor cell population, a proportion of this damaged DNA may have been excised *in vivo* or may be lost as small fragments during the isolation procedure. The net result would be a decrease in specific activity of the DNA recovered. The results suggest that counter-current distribution offers a complementary approach for the study of DNA secondary structure as this method reveals alterations occurring over a wider temperature range than the increase in UV absorption.

6693 EFFECTS OF VARYING THE EXPOSURE TO PHENOBARBITAL ON ITS ENHANCEMENT OF 2-ACETYLAMINOFLUORENE-INDUCED HEPATIC TUMORIGENESIS IN THE RAT. (E.) Peraino, C. (Argonne Natl. Lab., Ill.), R. J. M. Fry, E. Staffeldt and W. E. Kisieleski. *Cancer Res* 33(11):2701-2705, 1973.

In a previous study, phenobarbital feeding enhanced hepatic tumorigenesis in rats previously fed 2-acetylaminofluorene (AAF). This enhancement was analyzed by comparing tumor incidences in rats fed phenobarbital for various periods following a fixed exposure to AAF. A 5- or 20-day treatment with phenobarbital immediately after cessation of AAF feeding produced little tumorigenic enhancement, in comparison with the several fold enhancement seen in rats receiving phenobarbital for 100 days or longer. On the other hand, the interposition of a 10- or 30-day interval between the cessation of AAF treatment and the beginning of phenobarbital treatment (which was then continued throughout the experiment) produced enhancement comparable to that produced by beginning the phenobarbital treatment immediately after cessation of AAF feeding. These results indicated that: prolonged exposure to phenobarbital was required for tumorigenic enhancement; and the tumorigenic lesion produced by AAF was relatively stable, its expression being enhanced by phenobarbital long after the cessation of AAF treatment. Observation of the kinetics of tumor incidence throughout the experiment showed that phenobarbital: decreased the latent period between the end of the carcinogen treatment and the appearance of tumors; increased the growth rate of the tumors; and increased the rate of appearance of new tumor foci. No metas-

tases were seen in rats given AAF alone or followed by phenobarbital, and the morphological characteristics of the tumors were similar with both types of treatment. Phenobarbital, therefore, did not appear to alter the degree of differentiation of the tumors.

6694 BINDING OF ³H-LABELED BENZO[a]PYRENE TO DNA IN HAMSTER TRACHEAL EPITHELIAL CELLS.

(E.) Kaufman, D. G. (Nat'l. Cancer Inst., Bethesda, Md.), V. M. Genta, C. C. Harris, J. M. Smith, M. B. Sporn and U. Saffiotti. *Cancer Res* 33(11):2837-2841, 1973.

Isolated tracheas were incubated *in vitro* in the presence of tritiated benzo[a]pyrene. Highly purified DNA was isolated from the epithelial cells of these tracheas and was found to contain bound BP-³H. In tracheas obtained from hamsters previously treated intratracheally with benzo[a]pyrene plus Fe₂O₃, this binding was enhanced. Incubation of tracheas in the presence of 7,8-benzoflavone or at a temperature of 0°C resulted in inhibition of this enhanced binding. These results suggest that the tracheal epithelium is able to metabolize benzo[a]pyrene and that this metabolism is necessary for the inducible binding of benzo[a]pyrene to DNA in this tissue.

6695 A SIMPLIFIED METHOD FOR THE TREATMENT OF SINGLE CELLS WITH CHEMICAL CARCINOGENS.

(E.) Parodi, S. (Dept. Pharmacol., Trieste, Italy), A. Furlani, V. Scarcia, G. Brambilla and M. Cavanna. *Pharmacol Res Commun* 5(2):101-109, 1973.

A simple and reliable method for treating single cells within a culture with chemical carcinogens is described. The method, which involves the use of a 'conditioned' medium and microtest plates, assures good cloning efficiency with independent growth and a high probability of clones of monocellular origin. It also avoids the necessity of a feeder layer, which can present interferences due to the metabolic activity of irradiated cells. The procedure was tested using an established line of fibroblastic cells derived from mouse embryos. These cells, which normally show a low cloning efficiency and which display a low tumorigenic capacity in adult syngeneic mice, were treated with 3-methylcholanthrene dissolved in dimethyl sulfoxide. The carcinogenic activity of these cells was then evaluated by injecting them into adult syngeneic mice.

6696 INDUCTION OF MUTATIONS IN DNA-REPAIR DEFICIENT BACTERIA BY A LIVER MICROSOMAL METABOLITE OF AFLATOXIN B₁. (E.) Garner, R. C. (Sch. Med., U. Leeds, Yorkshire, England) and C. M. Wright. *Br J Cancer* 28(6):544-551, 1973.

Certain strains of *Salmonella typhimurium* and *Escherichia coli*, particularly those which are very sensitive to UV light, are killed when incubated with rat liver mixed function oxidases and aflatoxin B₁. *UvrA* or *recA* strains of *E. coli* are more susceptible than the wild-type strain, while the double mutant

uvrA recA is the most sensitive strain yet tested. The aflatoxin B₁ metabolite is also able to induce reverse mutations in two histidine auxotrophic strains of *S. typhimurium*, one strain of which is reverted specifically by frame shift mutagens and the other by agents inducing base pair substitutions. Pretreatment of rats with either 3-methylcholanthrene or benzo(a)pyrene, both inducers of liver microsomal mixed function oxidases, did not alter the amount of lethal aflatoxin B₁ metabolite formed, whereas an increase was observed after phenobarbitone pretreatment. Addition of the nucleophiles methionine, cysteine, glutathione, sodium thiosulphate, or sodium sulphide, or the epoxide hydrolase inhibitor, cyclohexene oxide to the toxicity assay medium did not alter bacterial killing by the aflatoxin B₁ metabolite. 2,3-Dimercaptopropanol had some protective action. Toxic metabolites were also formed when 5-methoxysterigmatocystin, O-methylsterigmatocystin, parasiticol or versicolorin A, but not versicolorin B, were incubated with mixed function oxidases. The relationship between the metabolite of aflatoxin B₁ lethal to bacteria and that which initiates liver cancer is discussed.

6697 BIOLOGICAL EFFECT OF ASBESTOS DUST ON THE PERITONEAL VISCERA OF RATS. (E.)

Engelbrecht, F. M. (Dept. Physiol., U. Stellenbosch, South Africa) and B. F. Burger. *S Afr Med J* 47(38):1746-1750, 1973.

Suspensions of crocidolite and chrysotile asbestos were injected into the abdominal walls of female albino rats. Within 10-17 months, nine of the 10 animals treated with crocidolite developed peritoneal tumors, while only three of the 10 animals treated with chrysotile showed a similar pathology. Macroscopically, the tumors appeared to be spherical nodules and plaque-like growths. Histologically, the lesions appeared to be mesotheliomas. One of the crocidolite treated animals developed a uterine tumor and tumor cell infiltration of the liver, pancreas, spleen, abdominal wall, and gut wall occurred in almost every case. In one case, metastases were found in the liver. The pathogenesis of the tumors appeared to proceed from a granulomatous stage, to a stage of fibrosis, to a stage of anaplasia, to a stage of neoplastic proliferation, to a stage of differentiation of the malignant cells. The data indicate that crocidolite is much more carcinogenic than chrysotile, possibly due to differences in its chemical composition and/or physical structure.

6698 METHYLHYDRAZINE TUMORIGENESIS IN SYRIAN GOLDEN HAMSTERS AND THE MORPHOLOGY OF MALIGNANT HISTIOCYTOMAS. (E.) Toth, B. (U. Nebraska Med. Ctr., Omaha) and H. Shimizu. *Cancer Res* 33(11):2744-2753, 1973.

A 0.01% solution of methylhydrazine was administered daily in the drinking water of 6-wk-old randomly bred Syrian golden hamsters for the remainder of their lifetime. The treatment gave rise to malignant histiocytomas of the liver and tumors of the cecum. Thirty-two percent of the females and 54%

of the males developed malignant histiocytomas, whereas among the controls no such lesions were seen. The incidence of tumors of the cecum was 18% in females and 14% in males, compared to 1% in the controls. Macroscopic, light and electron microscopic, and histochemical investigations of the liver lesions showed the characteristic appearance of malignant histiocytomas. The histological involvement of the tissues by the tumors is presented and the fine structure of the malignant histiocytoma, the nuclei, and cytoplasm with organelles of the tumor cells are described and illustrated in detail. Methylhydrazine is a rocket fuel component, and some of its derivatives have been proposed for use in treating certain human cancers. Because it has been shown to produce tumors in mice and now in hamsters, precautions should be taken when using it.

- 6699 THE CARCINOGENIC ACTIVITY OF 3-HYDROXYMETHYL-1-([3-(5-NITRO-2-FURYL)ALLYLDIDENE]AMINO)-HYDANTOIN IN RATS. (E.) Tekeli, S. (Sci. Div., Abbott Labs., N. Chicago, Ill.), C. G. Biava and J. M. Price. *Cancer Res* 33(11):2894-2897, 1973.

A carcinogenicity study with 3-hydroxymethyl-1-([3-(5-nitro-2-furyl)allyldidene]amino)hydantoin was conducted in male and female Sprague-Dawley rats. The compound was given in the diet at a dose level of 0.231% (136 mg/kg/day). The administration of this compound was discontinued in males after 11 months and in females after 12 months of treatment. All surviving animals were then fed the control diet for another 12 months. Formic acid-2-[4-(5-nitro-2-furyl)-2-thiazolyl]hydrazide was used as a positive control at an equimolar dose level. Between the test months 7 and 11, a high incidence of fatalities occurred among male rats treated with 3-hydroxymethyl-1-([3-(5-nitro-2-furyl)allyldidene]amino)-hydantoin. The cause of death was uremia resulting from severe nephrotoxicity, as evidence by blood urea determination and microscopic examination. The occurrence of renal tumors (one renal adenocarcinoma and six renal adenoma among males and five adenocarcinoma and 14 renal adenoma among females) indicates that 3-hydroxymethyl-1-([3-(5-nitro-2-furyl)allyldidene]amino)hydantoin is carcinogenic. Formic acid-2-[4-(5-nitro-2-furyl)-2-thiazolyl]hydrazine produced various types of kidney, liver, gastrointestinal tumors as previously reported.

- 6700 QUANTITATIVE AND QUALITATIVE STUDIES OF CHEMICAL TRANSFORMATION OF CLONED C3H MOUSE EMBRYO CELLS SENSITIVE TO POSTCONFLUENCE INHIBITION OF CELL DIVISION. (E.) Reznikoff, C. A. (Med. Sch., U. Wisconsin, Madison), J. S. Bertram, D. W. Brankow and C. Heidelberger. *Cancer Res* 33(12):3239-3249, 1973.

A line of C3H mouse embryo cells (C3H/10T1/2 clone 8) sensitive to postconfluence inhibition of cell division was used to study chemical oncogenesis in culture. The polycyclic hydrocarbons (PH), 3-methylcholanthrene, dibenz[a,h]anthracene, and 7,12-dimethylbenz[a]anthracene, caused varying degrees of cytotoxicity and produced morphologically and

malignantly transformed foci in these cells with a dose-dependent frequency, while *N*-methyl-*N'*-nitro-*N*-nitroso-guanidine was toxic but did not transform under the same conditions. Transformation frequency was related to cell density at the time of treatment and to the duration of PH treatment. After treatment of the cells with PH, three types of morphologically altered foci were identified. Foci of each type were cloned and inoculated into irradiated syngeneic mice. Two of the three types of foci gave rise to fibrosarcomas when the cells were inoculated after 2 to 4 passages after cloning. The determination of transformation frequency in this system includes only these two types of malignantly transformed foci. The third type of focus was morphologically minimally altered but did not give rise to tumors under the same conditions. Control cells did not produce tumors. The saturation densities of several transformed lines were greater than that of the control line and did not correlate with the growth rate of the cells. The antimycotic agent amphotericin B (Fungizone) interfered with transformation when it was present in the medium at the time of exposure of the cells to PH.

- 6701 LOCALIZATION OF BENZO[*a*]PYRENE-³H AND ALTERATIONS IN NUCLEAR CHROMATIN CAUSED BY BENZO[*a*]PYRENE-FERRIC OXIDE IN THE HAMSTER RESPIRATORY EPITHELIUM. (E.) Harris, C. C. (Natl. Cancer Inst., Bethesda, Md.), D. G. Kaufman, M. B. Sporn, H. Boren, F. Jackson, J. M. Smith, J. Pauley, P. Dedek and U. Saffiotti. *Cancer Res* 33(11):2842-2848, 1973.

The intratracheal instillation of benzo[*a*]pyrene (BP)-Fe₂O₃ in the Syrian golden hamster caused a number of changes in nuclear structure. A selective increase in the cross-sectional area of the basal cell nuclei was observed in multiple focal areas in the tracheal epithelium. This increase represented an enlargement in the cross-sectional area of the euchromatin and a dispersion of the heterochromatin. In short-term tracheal organ culture, incubation with BP-³H resulted in the labeling of nuclear and cytoplasmic sites in mucous, basal, and ciliated cells. Quantitative light microscopic autoradiography revealed that the prior *in vivo* administration of unlabeled BP caused a subsequent increase in the *in vitro* binding of BP-³H to epithelial cells. The total binding of BP-³H to epithelial cells was inhibited by the addition of 7,8-benzoflavone to the incubation medium and by incubation at 0 C. These results suggest that BP must be enzymatically activated before it can be bound. The BP-³H was localized primarily in the heterochromatin, as determined by electron microscopic autoradiography.

- 6702 EXPERIMENTAL TUMORS OF THE SCIATIC NERVE IN MONKEYS. (Rus.) Beniashvili, D. Sh. (Sci. Res. Inst. Oncol., Tbilisi, USSR). *Vopr Onkol* 19(12):51-57, 1973.

Tumors were induced in 5 of 14 *Macaca mulatta* monkeys (seven males and seven females, aged three to four yr) by direct injection of polycyclic aromatic hy-

drocarbons into the sciatic nerve. Nine of the monkeys received 100-120 mg of 9,10-dimethylbenz(a)-anthracene (DMBA) and six were given 5-50 mg of benzo(a)pyrene (BP) in olive oil. Tumors developed in three of the six monkeys given BP and in two of the nine given DMBA. The latent time for DMBA was shorter (one yr five months and two yr three months) than for BP (two yr six months to three yr one month). All animals were observed for four yr. The tumors averaged 3-4 cm in diameter, and their wt varied from five to 12 g. Histological examinations revealed that three tumors were benign neurinomas (two with a reticular structure and one with a fascicular structure and Verocay's bodies) and two were malignant. One of the two monkeys with malignant tumors had multiple metastases in the lungs at autopsy.

- 6703 COMPARISON OF BLADDER TUMORS INDUCED IN RATS AND MICE WITH N-BUTYL-N-(4-HYDROXY-BUTYL)-NITROSOAMINE. (E.) Akagi, G. (Sch. Med., Tokushima U., Japan), A. Akagi, M. Kimura and H. Otsuka. *Gann* 64(4):331-336, 1973.

Male Wistar rats (60) and male BALB/c mice (46) received 0.05% N-butyl-N-(4-hydroxybutyl)nitrosoamine (BBN) solution as drinking water. The mean daily dose of carcinogen was 41.0 mg/kg for rats and 83.9 mg/kg for mice. Among 49 rats treated with BBN for more than 10 wk, hyperplasia of the mucosa, consisting of 8-15 cell layers, was observed in 8 rats, papilloma in 5 rats, and carcinoma of the bladder in 36 rats. Four hyperplasias, 3 papillomas, and 36 carcinomas of the bladder developed in 43 mice under similar conditions. After more than 25 wk, all the rats and mice examined had developed tumors including 3 papillomas in the bladder. The mean induction time of carcinomas was 55.1 wk in rats and 30.7 wk in mice. All carcinomas induced in rats were papillary, and histologically they were transitional cell (83.3%) or squamous cell (16.7%) type. About 2/3 of the tumors showed no invasion into the bladder wall. Carcinomas of mice were squamous cell (52.8%), transitional cell (38.9%), or anaplastic (8.3%) type, and all were more or less invasive. In rats no tumors developed outside the urinary system, whereas, in the mice, one adenoma of the lung and one renal pelvic carcinoma were also noted. No metastatic foci were found in rats or mice.

- 6704 MULTIPLE MYELOMA: DEVELOPMENT OF PLASMA CELL SARCOMA DURING APPARENTLY SUCCESSFUL CHEMOTHERAPY. (E.) Holt, J. M. (Radcliffe Infirmary, Oxford, Great Britain) and A. H. T. Robb-Smith. *J Clin Pathol* 26(9):649-659, 1973.

Three patients undergoing apparently successful treatment for multiple myeloma developed plasma cell sarcoma during the treatment period. The patients were a 55-yr-old woman, a 65-yr-old woman, and a 70-yr-old man; two were treated with cyclophosphamide, while the other received melphalan and radiotherapy. In each case, the myelomatosis was in remission when a reticulosarcoma developed; the main tumor mass was in the extralymphoreticular tissue. The bone marrow of each patient was hypo-

plastic with small foci of myeloma plasma cells, and in two cases there were also foci of abnormal plasma cells resembling the tumor. In the third case, there were tumor deposits infiltrating but distinct from the normal marrow. The evidence indicates that, in all three cases, the chemotherapy induced the reticulosarcomatous change, although it is possible that the reticulosarcomatous change arose as a complication of the myelomatosis because of the long survival times involved.

- 6705 THE ROLE OF THYMYDYLATE SYNTHETASE INHIBITORS IN BROMODEOXYURIDINE-INDUCED NEOPLASIA IN *DROSOPHILA*. (E.) Rizki, R. M. (Dept. Zool., U. Michigan, Ann Arbor) and T. M. Rizki. *Cancer Res* 33(11):2856-2861, 1973.

When 5-bromodeoxyuridine (BUdR) or 5-iododeoxyuridine is administered to *Drosophila* larvae together with 5-fluorouracil, many of the adult flies show growth lesions in the form of extra bristles and other supernumerary wing structures. The hypothesis that the growth lesions are the result of thymidine analog incorporation in the DNA and that the effects of this incorporation are increased by feeding 5-fluorouracil, which interferes with the endogenous synthesis of thymidine monophosphate, was tested by using two other inhibitors of thymidylate synthetase in combination with BUdR. In the presence of methotrexate or trifluorothymidine (F₃TdR), the incidence of neoplastic lesions was markedly increased over that obtained in control larvae given BUdR alone. 5-Fluorouracil and methotrexate do not induce extra bristles or growth of supernumeraries in *Drosophila*, but F₃TdR alone induces lesions similar to those seen following treatment with a combination of BUdR and a thymidylate inhibitor. This exceptional case supports the above hypothesis since F₃TdR is not only an inhibitor of thymidylate synthetase but can also be incorporated into DNA. The increased incorporation of BUdR in *Drosophila* DNA is demonstrated by giving methotrexate or F₃TdR to actively feeding larvae, and DNA samples from larvae given BUdR-³H with these inhibitors were examined by CsCl density-gradient centrifugation.

- 6706 INTERACTIONS OF PHORBOL ESTERS WITH CELLULAR MEMBRANES *IN VITRO*. (E.) Kubinski, H. (U. Wisconsin Med. Sch., Madison), M. A. Strangstalien, W. M. Baird and R. K. Boutwell. *Cancer Res* 33(12):3013-3107, 1973.

Escherichia coli DNA mixed with purified microsomal membrane from rat liver forms stable complexes which can be detected by equilibrium density gradient centrifugation in CsCl. The esters of phorbol all changed one or more of the following parameters: the membrane density, its macroscopic appearance, and/or the amounts of DNA associated with the narrow band of the membrane. The parental compound phorbol did not affect any of these characteristics.

While some of the phorbol esters modified the association of DNA with the membrane, there was no direct correlation between the degree of interference and the tumor promoting activity of the compound. Binding of one of the esters tested, phorbol-12,13-didecanoate-³H (PDD-³H), was followed by measuring the amounts of tritium label associated with the membrane band. The ester appeared to bind at or close to the DNA 'receptor' on the membrane and preferentially associate with the DNA-membrane complex. Thus, strong promoters may share the same or adjacent binding sites on the membrane; a rough correlation was seen between the promoting activity of a compound and its ability to compete with PDD. The association between the membranes and phorbol esters occurred under a wide variety of conditions and involved bonds strong enough to withstand prolonged exposure to high salt concentrations.

- 6707 EXCRETION AND METABOLISM OF 7,12-DIMETHYLBENZ(a)ANTHRACENE (DMBA) AFTER ITS ORAL ADMINISTRATION TO NORMAL MICE AND MICE PRETREATED WITH 3-METHYLCHOLANTHRENE (3-MC). (Fr.) Gentil, A. (Sci. Res. Inst. Cancer, Villejuif, France), C. Lasne and I. Chouroulinkov. *C R Acad Sci (D) Paris* 277(24):2849-2852, 1973.

¹⁴C-Labeled 7,12-dimethylbenz(a)anthracene (DMBA; 1 mg p.o. through a stomach tube) was administered to normal adult female IC mice and to mice treated 36 hr before with 3-methylcholanthrene (MC; 2 mg p.o. through a stomach tube). The vehicle for both carcinogens was olive oil. Pretreatment with MC had no significant effect on the amount or rate of fecal or urinary excretion of the radioactivity. More radioactivity was recovered from the feces than from the urine in both groups of animals. Pretreatment with MC appeared to favor conversion of DMBA into water-soluble metabolites, but the difference between pretreated and normal mice was not significant. Pretreatment with MC did increase the percentage of polar metabolites in water-in-soluble extracts from both the urine and feces. This increase was particularly evident in the urine where large increases were found in excretion of 7-hydroxymethyl-12-methylbenz(a)anthracene derivatives; 8,9- and 10,11-dihydrodiols; and 7-carboxy-12-methylbenz(a)-anthracene. It is suggested that DMBA stimulates its own metabolism in the first few hours after its ingestion by induction of microsomal enzymes. This lessens differences between normal mice and those pretreated with MC.

- 6708 HORMONES IN THE AETIOLOGY AND CLINICAL COURSE OF BREAST CANCER. (E.) Wang, D. Y. (Imperial Cancer Res. Fund, London, Great Britain), M. C. Swain, J. L. Hayward and R. D. Bulbrook. *Recent Results Cancer Res* 39:177-184, 1972.

Women in whom a diagnosis of breast cancer was made tended to excrete smaller amounts of etiocholanolone than normal controls, and further studies have indicated that pre-cancer cases exhibit a subnormal excretion of androsterone and etiocholanolone. In addition, there is a direct inverse relationship

between the amount of urinary etiocholanolone and the risk of breast cancer. Low plasma dehydroepiandrosterone sulfate (DS) concentrations in women with benign breast tumors are also associated with a high risk of breast cancer. Mastectomy is generally associated with a significant decrease in the level of plasma DS, so that post-mastectomy patients have markedly subnormal DS levels. Further, after mastectomy, women with relatively low plasma DS levels have a faster rate of tumor recurrence. Patients with advanced breast cancer who excrete subnormal amounts of urinary androgen metabolites tend to respond badly to endocrine ablation; there is little correlation between estrogen excretion and response to endocrine ablation. There is some evidence that the subnormal excretion of estrogen may also be related to a high risk of breast cancer. Several explanations for the relationship between low urinary androgen levels and breast cancer are given: androgen metabolite excretion decreases in many chronic diseases of which breast cancer is one; the androgens may be involved in the control of tumor growth; and androgen abnormalities are indicators of other more fundamental changes in the endocrine environment.

- 6709 ANASTOMOTIC CARCINOMAS IN GASTRECTOMIZED RATS AFTER ADMINISTRATION OF N-METHYL-N'-NITRO-N-NITROSOGUANIDINE. (Ger.) Dahm, K. (Anat. Inst., U. Hamburg, Germany) and B. Werner. *Dtsch Med Wochenschr* 98(52):2486-2487, 1973.

Partial gastrectomy and gastroduodenostomy or gastrojejunostomy were performed on 3-month-old male Wistar rats. Starting 5 wk after surgery, N-methyl-N'-nitro-N-nitrosoguanidine (120 mg/liter) was added to their drinking water for 31 wk. Carcinomas, almost all of which were located at the anastomosis, were found in 12 operated rats. The first three carcinomas were diagnosed 23 and 24 wk after institution of treatment. Precancerous changes were found in the stomachs of 12 other animals. Only one case of adenomatous hyperplasia in the small curvature was observed in the 24 controls. These results suggest that exogenous carcinogens accelerate the induction of anastomotic carcinomas. This experimental model of anastomotic carcinoma might be used to investigate the pathogenesis of cancer in gastrectomized patients.

- 6710 ANDROGENIC CAUSE OF BREAST CARCINOMA AND ENDOMETRIAL HYPERPLASIA. (E.) Grattarola, R. (Natl. Tumor Inst., Milan, Italy). *Cancer Cytol* 12(2):25-28, 1972.

Women who have an atypical endometrial hyperplasia together with increased androgenic activity are at a relatively high risk of developing breast cancer. When a group of premenopausal normal controls were compared with a group of women whose premenstrual endometrium showed an atypical pattern or who exhibited a polycystic ovarian syndrome (at risk group), the urinary androgen levels, and especially the urinary testosterone levels, of the at risk group were significantly higher than those of the

control group; there were no differences in urinary estrogen levels. The urinary excretion of dehydroepiandrosterone, etiocholanolone, and androsterone was also higher in a group of patients with an atypical endometrial pattern and in a group of premenopausal breast cancer patients with a progestational or atypical endometrium; the same pattern was observed in postmenopausal breast cancer patients with atypical endometrial patterns. No differences were found between a group of breast cancer patients with a simple proliferative endometrium and a group of normal controls. In the former group, the levels of estradiol-17 β were significantly elevated. Postmenopausal women showing an atypical endometrial pattern without breast cancer also excreted increased amounts of androgens.

- 6711 EFFECTS OF DIMETHYLBENZ(a)ANTHRACENE AND DIHYDROTESTOSTERONE ON ESTRADIOL-17 β BINDING IN RAT MAMMARY CYTOSOL FRACTION. (E.) Keightley, D. D. (Dept. Biol., U. Windsor, Canada) and A. B. Okey. *Cancer Res* 33(11):2637-2642, 1973.

The uteri of 10 female Sprague-Dawley rats were removed 3 days after the administration of a single oral dose of 20 mg dimethylbenz(a)anthracene (DMBA). In a second experiment, the lactating mammary glands of female rats with 5-day-old pups were removed 3 days after the administration of DMBA. The binding of 2,4,6,7-estradiol-17 β -³H to its specific cytosol receptor derived from the lactating mammary tissue was studied by the dextran-coated charcoal technique. Nonradioactive estradiol-17 β strongly inhibited the binding of the 2,4,6,7-estradiol-17 β -³H. Neither DMBA *in vivo* or *in vitro* nor dihydrotestosterone *in vitro* showed significant competition for the estrogen binding sites. Thus, the mechanism of action of DMBA in tumorigenesis does not involve binding of these compounds to the estrogen receptor; nor does the mechanism of action of dihydrotestosterone in the inhibition of tumor development. These compounds do not inhibit the binding to estradiol-17 β to its receptor.

- 6712 ENHANCEMENT OF SKIN TUMORIGENESIS BY A SINGLE APPLICATION OF CROTON OIL BEFORE OR SOON AFTER INITIATION BY URETHAN. (E.) Hennings, H. (Natl. Cancer Inst., Bethesda, Md.), D. Michael and E. Patterson. *Cancer Res* 33(12):3130-3134, 1973.

The importance of DNA synthesis in the initiation of skin tumorigenesis by urethan was investigated. Treatment of mice with 0.5% croton oil increases the rate of epidermal DNA synthesis 3- to 6-fold beginning after 9 to 12 hr, reaching a peak after 18 to 24 hr, and remaining elevated for 3 to 4 days. Croton oil treatment times of -24, -6, +1, and +24 hr were tested for their effect on the initiation of skin tumor formation by urethan injected at zero time. Controls treated with urethan alone developed 1.7 papillomas per mouse after 30 wk of tumor promotion. The latent period was 21 wk. Similar results were obtained in the group treated with croton oil at +24 hr (1.8 papillomas per mouse, 21-wk

latent period). In contrast, when croton oil was given at -24, -6, or +1 hr, tumor yields of 5.3, 5.3, and 4.8 papillomas per mouse were found, with the latent period shortened to 16 wk in all three groups. In the groups treated with croton oil at -6 and +1 hr, the earliest increase in rates of DNA synthesis occurred about 3 and 10 hr, resp., after urethan injection. Thus, if the enhancement of urethan initiation by croton oil is related to the croton oil-induced stimulation of DNA synthesis in the skin, then only DNA replication at times more than 10 hr after urethan injection could be important in the process of skin tumor initiation. The inhibition of DNA synthesis by hydroxyurea for about 9 hr beginning 1 hr before, 2 hr after, or 8 hr after the injection of urethan did not decrease the tumor incidence in the initiation-promotion experiments. These results suggest that increased DNA synthesis at the times tested is not necessary for the enhancement of urethan initiation by croton oil.

- 6713 THE EFFECT OF AFLATOXIN B₁ ON THE HEPATIC STRUCTURE AND RNA SYNTHESIS IN RATS FED A DIET MARGINALLY DEFICIENT IN CHOLINE. (E.) Butler, W. H. (Med. Res. Council Labs., Carshalton, Surrey, Great Britain) and G. E. Neal. *Cancer Res* 33(11):2878-2885, 1973.

Male Fischer rats were maintained on a normal diet or a diet deficient in choline from weaning for 10 days. At the end of the experimental feeding period, the animals were given i.p. injections of 4 or 8 mg/kg aflatoxin B₁. The choline deficient diet which induced a choline deficiency in the rats maintained on it, protected against the lethal action of aflatoxin B₁ and prevented the widespread perportal liver necrosis generally caused by this compound. The choline deficient diet did not prevent the rapid inhibition of RNA polymerase or the changes in nucleolar morphology which normally result following the administration of aflatoxin B₁. Thus, the diet appeared to separate those changes in the liver associated with hepatotoxicity from those associated with hepatocarcinogenicity.

- 6714 HISTOCHEMICAL STUDIES ON NUCLEASE ACTIVITY AND NEOPLASTIC TRANSFORMATION IN RAT LIVER DURING DIETHYLNITROSAMINE CARCINOGENESIS. (E.) Fontaniere, B. (Notre Dame Hosp., Montreal, Canada) and R. Daoust. *Cancer Res* 33(12):3108-3111, 1973.

RNase activity was studied in the livers of male Sprague-Dawley rats given 0.01% diethylnitrosamine in the drinking water over a 16-wk period. The animals receiving diethylnitrosamine showed evidence of early degenerative changes in the hepatic tissue. Regeneration of the damaged tissue began four wk after the cessation of the drug treatment. Various portions of the hyperplastic parenchyma exhibited hyperbasophilic properties after 8 wk of drug treatment, and hepatomas were observed after 10 wk of treatment. The tumors were hyperbasophilic. The diethylnitrosamine induced a focal loss of RNase activity in the hyperplastic liver nodules prior to the de-

velopment of the hyperbasophilic foci and hepatomas; the alteration in RNase was noted 4 wk after drug treatment. The RNase deficiency, formation of hyperbasophilic foci, and development of hepatomas were well correlated in terms of topographical distribution. The data support the hypothesis that the loss in RNase activity may represent an alteration in the hyperplastic hepatocytes that allows them to undergo other changes leading to a true neoplastic state.

6715 MODELS AND FACTS IN IATROGENIC CARCINOGENESIS. (REVIEW). (Ger.) Goerttler, K. (German Cancer Res. Ctr., Heidelberg). *Verh Dtsch Ges Pathol* 56:138-164, 1972.

Ionizing radiation, cytostatics, immunosuppressants, and hormones can increase the risk of cancer in both man and laboratory animals, but to different extents and only in combination with other factors. In many cases it is difficult to determine whether certain drugs or physical factors are responsible for the development of cancer since results obtained experimentally cannot always be extrapolated to humans. While there is adequate clinical documentation to show that some drugs, e.g. Thorotrast, are carcinogenic, evidence for the carcinogenicity of others (cyclamates, saccharine) is based only on animal studies. Long-range prospective studies of large numbers of patients will be needed to determine whether oral contraceptives increase the risk of cancer. While cortisone and radiotherapy have been used in the treatment of malignancies, these agents can sometimes induce tumors so the benefits and risks must be weighed. Chloramphenicol, phenylbutazone, and phenacetin have been implicated in the induction of malignancies. Vaccines are another potential source of iatrogenic carcinogens; e.g. some lots of Salk polio vaccine have been shown to contain SV40, a virus which induces tumors in a variety of animal species. Immunosuppressants and radiation can induce malignancies by interfering with the body's immune response, particularly in patients with immune or autoimmune diseases. Cancer can develop after surgery, e.g. kidney transplantation, gastrectomy, implantation of foreign-body prostheses. A number of agents have been found to have a diaplacental carcinogenic activity in animals, and it has recently been demonstrated that stilbesterol can cause vaginal adenocarcinomas in the daughters of mothers given this drug during pregnancy.

6716 DISTRIBUTION OF RADIOACTIVITY AND METABOLISM OF FORMIC ACID 2-[4-(5-NITRO-2-FURYL)-2-¹⁴C-2-THIAZOLYL]HYDRAZIDE FOLLOWING ORAL ADMINISTRATION TO RATS AND MICE. (E.) Cohen, S. M. (U. Wisconsin Med. Sch., Madison), A. Alter and G. T. Bryan. *Cancer Res* 33(11):2802-2809, 1973.

Formic acid 2-[4-(5-nitro-2-furyl)-2-thiazolyl]-hydrazide (FNT) has a demonstrated carcinogenic activity in rats and mice, causing high incidences of kidney and breast tumors in rats and forestomach tumors and lymphocytic leukemia in mice. Tumors of

other organs were also induced at lower incidence rates. The excretion patterns in the rats and mice were essentially similar when FNT was administered intragastrically, with a majority of the radioactivity being excreted within 24 hr in the urine and less in the feces after 24 hr. Very little was expired as ¹⁴CO₂ and less than 2.5% of the radioactivity was left in the animal after 96 hr. The tissue distribution of the radioactivity in rats revealed the highest concentrations in the kidney and forestomach of the rat and mouse, resp. Concentrations in the rat breast and mouse thymus and spleen were comparable to the levels in the carcass, while levels in other tissues were similar to or somewhat higher than those in the carcass. When the urine from these animals was chromatographed on Whatman No. 1 paper and developed with methanol:butanol:benzene:water:glacial acetic acid (40:20:20:20:1), the radioactivity with an R_f corresponding to the original chemical was less than 10% (usually 2 to 5%) of the total activity in the urine. This suggested that the chemical was metabolized before being excreted in the urine. After the administration of FNT intragastrically at 0, 4, and 8 hr to weanling female rats, the rats were killed at 12 hr and the kidneys and liver were fractionated by ultracentrifugation. The distribution of radioactivity in the nuclear, mitochondrial, microsomal, and cytosol fractions was 28.4, 14.6, 5.7, and 51.2% and 20.2, 8.0, 3.4, and 68.4% in liver and kidney, resp. When the cytosol fraction was chromatographed on Sephadex G-25 columns, 51.4% of the radioactivity appeared in the macromolecular peak from kidney and 19.8% appeared from liver. Comparable amounts of cytosol radioactivity were precipitated by the trichloroacetic acid. When the labeled chemical was added to "cold" homogenate, more than 90% of the radioactivity appeared in the cytosol fraction of the kidney and liver, and none appeared in the macromolecular peak when chromatographed on Sephadex G-25 columns. These data indicate that FNT interacts with kidney and liver macromolecules and that it must be metabolized before the interaction can occur. The synthesis of FNT is described.

6717 EFFECT OF LIVER FUNCTION DISORDERS ON THE DEVELOPMENT OF BETA-NAPHTHYLAMINE-INDUCED BLADDER TUMORS IN DOGS. (Rus.) Martynenko, A. G. (Inst. Problems Oncol., Kiev, USSR), A. M. Romanenko and L. A. Kartasheva. *Patol Fiziol Eksp Terap* (3): 55-56, 1973.

β-Naphthylamine (BNA) was given to seven dogs in gelatin capsules six times a wk for one yr four months. Doses were gradually increased from 5 mg/kg to 30 mg/kg (total dose 9 g/kg). In addition, four dogs received carbon tetrachloride (CCl₄) 1:1 in sunflower oil p.o. through a stomach tube, starting eight days before administration of BNA. After four doses of 5 ml each, 1-10 ml were administered at intervals of two days to five months or more, depending upon the dog's liver function (total of 256-392 ml CCl₄). Liver function was assessed by the bromphenol blue test, refractometric determination of total serum protein, and electrophoretic analysis of serum protein fractions. BNA first in-

duced chronic inflammation of the bladder, primarily in the submucosa. Cystoscopic examinations showed localized hyperemia, injection of the blood vessels, and the development of inflammatory polyps. These polyps, which appeared from 2.5 months to one yr seven months after institution of BNA treatment, were not related to subsequent development of tumors. Tumors developed significantly later in CCl₄-treated dogs (28-36 months) than in controls (21-24 months), and one CCl₄-treated dog never did develop a bladder tumor, even after four yr eight months. No appreciable morphological differences were observed between tumors in CCl₄-treated dogs and controls. In some cases, both benign and malignant changes in the bladder regressed completely. Liver cancer developed in three of the four dogs treated with CCl₄ and BNA.

- 6718 CHRONIC TOXICITY OF AURAMINE. (Ger.) Zeller, H. (Med. Biol. Res. Lab., Badische Anilin Soda Fabrik, Ludwigshafen, Germany), H. Birnstiel, K. O. Freisberg, P. Kirsch and K. H. Hempel. *Naturwissenschaften* 60:523-524, 1973.

Technical auramine was fed to male and female Sprague-Dawley rats for 28 days (0, 100, 400 ppm), 90 days (0, 50, 100, 200 ppm) or 2 yr (0, 50, 100, 200 ppm). In a "stop" experiment auramine (0, 50, 100, 200 ppm) was fed for 90 days and the animals were then kept under observation for 2 yr. The doses were many times the maximum doses that could be ingested by man. No differences were found between auramine-treated rats and untreated controls in the number of animals with one, two or more tumors; the number of rats with benign + malignant tumors; or the number of rats with benign or malignant tumors, resp. No significant dose-effect relationship was found for the number of liver adenomas in male and female animals or in female animals alone in the 90-day "stop" experiment or in the 2-yr experiment. Thus, no evidence was found that auramine has a tumorigenic action.

- 6719 DETECTION OF ELECTRONICALLY EXCITED MOLECULES IN CIGARETTE SMOKE. (Ger.) Stauff, J. (Inst. Phys. Biochem., J. W. Goethe U., Frankfurt/Main, Germany), G. Reske and I. Simo. *Z Naturforsch* 28c(7/8):469-470, 1973.

By using an apparatus for measuring the chemiluminescence of gases, it was found that cigarette smoke emitted light of wavelengths between 350 and 600 nm. This might be caused by one or more chemical reactions occurring either in the smoke particles or tar. Since the emission of light remained unchanged when a puff was taken on the cigarette, the light must be caused by deposition of tar on the walls of the cuvette. This was confirmed by addition of methanol or ethanol which caused luminescence to increase ten-fold. If the smoke was immediately passed through an organic solvent, such as dimethylphthalate, one puff increased the luminescence which only decreased to one-tenth of its initial value approximately 60 min after the smoke stream was shut off. An analysis of the curve showing the decrease in luminescence revealed that neither a first- or a second-order reac-

tion had occurred, suggesting that a complicated mechanism is responsible for production of the excited states. This and the extremely slow decrease in luminescence provide definite evidence that a chemical reaction only begins after combustion of the tobacco. This reaction must include steps in which molecules capable of fluorescing or phosphorescing are excited. These findings indicate that when tobacco tar acts on biological substrates, the electronically excited molecules react only as in photochemical processes.

- 6720 STUDIES ON THE MODE OF PROLIFERATION OF RAT LIVER CELLS IN CHRONIC THIOACETAMIDE INTOXICATION. (E.) Bader, G. (Rostock-Südstadt, German Democratic Republic). *Beitr Pathol* 150(4):416-419, 1973.

Thioacetamide (25 mg/kg/diem)-induced carcinogenesis resulted in different modes of liver cell proliferation. Amitotic regeneration was noted during the first 2 wk, particularly around the centrolobular necroses, partly associated with a decrease in the number of binucleated liver cells in the residual parenchyma. Numerous nuclear divisions occurred 3 to 4 wk later during transition into thioacetamide-cirrhosis, and continued through the third month. In the second month, the binucleated liver cells were reduced in number, possible indicating a shorter time period of amitoses. The mitotic index dropped after 4-5 months and was subnormal after 9 months. At this point the percentage of binucleated cells was again reduced. In the preneoplastic stage, the mitotic index of thioacetamide-induced hepatomas was reduced 24 hr after surgery, returning to normal after 48 hr. The number of nuclei/unit area diminished after 24 hr, only in the thioacetamide-induced hepatomas, due to the regenerative enlargement of the liver cell. The percentage binucleated liver cells reached control levels 48 hr after hepatectomy. The proliferative activity following partial hepatectomy was studied after 8 to 9 months in the thioacetamide-induced hepatomas and in small pseudolobules; the regenerative capacity of the latter was more reduced.

- 6721 DIFFERENTIATION OF VARIOUS TYPES OF BIOLOGICAL OXIDATION OF NITROGEN IN ORGANIC COMPOUNDS. (E.) Gorrod, J. W. (Dept. Pharmacy, Chelsea Coll., U. London, England). *Chem Biol Interact* 7(5):289-303, 1973.

The data available on the oxidation of various types of nitrogen in organic compounds is reviewed in an attempt to differentiate among the various processes. Nitrogen-containing compounds are divided into three groups depending on their basicity: Group I compounds are the more basic aliphatic amines of pK_a 8-11; Group II compounds have a pK_a between 1 and 7; and Group III compounds are those in which the pK_a is below 1. The enzymatic processes involved in the oxidation of the nitrogen in these various types of compounds are reviewed by a consideration of species differences, age of animal, pH optima, influence of in-

ducing agents, inhibitors, and microsomal pretreatments, as well as the stereochemistry of the nitrogen atom. The data collected suggests that Group I compounds are oxidized by a flavine adenine nucleotide (FAD)-dependent enzyme system, whereas the Group III compounds are oxidized by a cytochrome P450-dependent system. Group II compounds may be substrates for both enzyme systems, which would yield the same products, but by different processes. The extent to which N-oxidation occurs in a species would therefore depend on the pK_a of the substrate and the amounts and ratio of the two enzymes present, a lower pK_a favoring oxidation by the cytochrome P450 system and a higher pK_a favoring oxidation by the FAD system. The oxidation of aromatic heterocyclic amines also depends upon the pK_a of the nitrogen group, compounds having a low pK_a being preferentially metabolized by nitrogen oxidation.

- 6722 BACTERIA, NITROSAMINES AND CANCER OF THE STOMACH. (E.) Hill, M. J. (St. Mary's Hosp. Med. Sch., London, England), G. Hawksworth and G. Tattersall. *Br J Cancer* 28(6):562-567, 1973.

Nitrosamines may be produced at any site where bacteria, secondary amine, and nitrate or nitrite are present together; these conditions might occur in individuals with bladder infections and those with gastric achlorhydria. The nitrosamines most likely to be formed in this manner are dimethylnitrosamine, N-nitrosopiperidine, and N-nitrosopyrrolidine. The mortality rate from stomach cancer in the borough of Worksoy was estimated for the period 1958 through 1971. During this time, the drinking water in Worksoy contained an average of 90 mg/l of nitrate, the highest level of any borough in the United Kingdom. The mortality figures were compared to those from control towns whose drinking water contained less than 10 mg/l nitrate. The death rate from stomach cancer in Worksoy was abnormally high, with the increase in deaths being more marked among the women than the men. The excess male deaths were all in the oldest age group, while the excess in female deaths were spread through all age groups but greatest in the oldest women. Since bacterial colonization of the stomach and bladder is rare in men below the age of 50 yr but fairly common in younger women, these data support the hypothesis that with high nitrate intake, carcinogenic nitrosamines are formed in the urinary bladder and that these give rise to gastric cancer.

- 6723 EFFECT OF TOBACCO TAR ON THE PALATES OF RATS AND MICE. (E.) Saigopal, G. (Andhra Med. Coll., Visakhapatnam, India), B. Narasimham, M. V. S. Raju and C. R. R. M. Reddy. *Clinician* 37(9):370-374, 1973.

The hard palates of inbred rats and mice were painted with acetone, room temperature crude tobacco tar, or hot crude tobacco tar. The acetone painted rat palatine mucosa showed mild hyperplasia of the squamous epithelial lining. In addition, the cold tar painted groups showed an increase in the keratin layer, while the hot

tar induced marked hyperortho and parakeratosis. There were no dysplastic changes in the hard palates and no abnormalities in the soft palates. More marked nonspecific changes were seen in the hard palates of the acetone painted mice. The mice painted with cold tar showed appreciable hyperortho and parakeratosis of the hard palate lining epithelium. There was also squamous metaplasia of the ducts of the mucous glands in the soft palate. In addition to these changes, the hot tar painted group showed mild dysplasia of the lining epithelium of the hard palate. In neither the rats nor the mice were any papular lesions seen which could be compared with stomatitis nicotina.

- 6724 BONDING OF BENZO(a)PYRENE TO NITROGEN HETEROCYCLES BY ANODIC OXIDATION. (E.)

Blackburn, G. M. (Dept. Chem., The U., Sheffield, Great Britain) and J. P. Will. *J Chem Soc* 2:67-68, 1973.

The anodic oxidation of benzo(a)pyrene (I) in the presence of pyridine or 4-picoline results in the formation in large quantities of 6-(N-pyridinium) and 6-(N-picolinium) derivatives. Similar oxidation of (I) in the presence of 1-methylimidazole leads to the formation of an N-methylimidazolium derivative of (I) which appears to be 1-(1-benzo(a)pyrenyl)-3-methylimidazolium perchlorate; the residue appears to be bonded to benzo(a)pyrene at C-1. The data suggest that if the radical cation of benzo(a)pyrene were generated by a biological one-electron oxidation in the vicinity of DNA, it could result in the linkage of (I) to a pyrimidine via C-6 but might exhibit a different regiospecificity for bonding to the imidazole ring of a purine base.

- 6725 ALPHA FETOPROTEIN LEVELS IN WOMEN TAKING ORAL CONTRACEPTIVES. (E.) Seppälä, M.

(U. Central Hosp., Helsinki, Finland). *Int J Fertil* 18(4):206-208, 1973.

The alpha fetoprotein and aspartatetransferase (ASAT) levels in the sera of 105 apparently healthy Finnish women taking oral contraceptives were measured via double antibody radioimmunoassay. While three of these women had increased ASAT concentrations, all had normal alpha fetoprotein levels. None of the women became jaundiced and the ASAT levels returned to normal two months after the contraceptives were discontinued. The results indicate that, at least among Finnish women, the use of oral contraceptives does not increase the risk of developing hepatocellular carcinoma.

- 6726 ONCOGENIC PURINE N-OXIDE DERIVATIVES AS SUBSTRATES FOR SULFOTRANSFERASE. (E.)

McDonald, J. J. (Mem. Sloan-Kettering Cancer Ctr., New York, N.Y.), G. Stöhrer and G. B. Brown. *Cancer Res* 33(12):3319-3323, 1973.

The susceptibility of a series of oncogenic and nononcogenic purine N-oxide derivatives to the action of rat liver sulfotransferase was measured

by a new assay which involves the conjugation of sulfate with an unlabeled substrate by PAPS^{2-35S} and a crude enzyme preparation from rat liver. Determination of the ³⁵SO₄= subsequently liberated provides a measurement of the susceptibility of the substrate. The data indicate that sulfate conjugation is not a limiting condition from oncogenicity. The assay was also used to detect purine N-oxide sulfotransferase activity in bovine trachea fibroblasts in culture. The sulfotransferase activity in a high-speed supernatant preparation from these cells was comparable to that in the rat liver supernatant. For the four compounds tested, the relative acceptor activities were comparable to those found with the rat liver enzyme.

- 6727 MICROSOMAL METABOLISM OF DIMETHYLNITRO-SAMINE AND THE CYTOCHROME P-450 DEPENDENCY OF ITS ACTIVATION TO A MUTAGEN. (E.) Czygan, P. (Stratton Lab. Study Liver Disease, New York, N.Y.), H. Greim, A. J. Garro, F. Hutterer, F. Schaffner, H. Popper, O. Rosenthal and D. Y. Cooper. *Cancer Res* 33(11):2983-2986, 1973.

The oxidative demethylation of dimethylnitrosamine (DMN) by isolated liver microsomes from control mice and animals treated with polychlorinated biphenyls was compared with the mutagenic effect of DMN on *Salmonella typhimurium*. The kinetics of the two reactions were similar and the rates of demethylation and DMN activation increased following induction of the cytochrome P-450 mixed-function oxidase system by polychlorinated biphenyls. Both the oxidative demethylation and the activation of DMN to a mutagen were inhibited by carbon monoxide, with the inhibition being maximally reversed by monochromatic light at 450 nm. Thus, both the microsomal metabolism and activation of DMN to a mutagen are cytochrome P-450 dependent.

- 6728 DISTRIBUTION OF CHROMOSOME CONSTITUTIVE HETEROCHROMATIN OF SYRIAN HAMSTER CELLS TRANSFORMED BY CHEMICAL CARCINOGENS. (E.) DiPaolo, J. A. (Natl. Cancer Inst., Bethesda, Md.) and N. C. Popescu. *Cancer Res* 33(12):3259-3265, 1973.

The heterochromatin distribution of metaphase chromosomes from nine transformed Syrian hamster cell lines and four primary tumors (obtained by injecting the transformed cells into living animals) were studied via the horizontal C band technique. The transformed cell lines were obtained by treating the hamsters with various chemical carcinogens. Of the cells studied, only those from two tumors contained abnormal heterochromatin segments; the other had chromosomes with constitutive heterochromatin characteristic of the species. In addition, to the completely heterochromatic short arms of the submetacentric autosomes, the long arms of both the X and E20 chromosomes were entirely heterochromatic. The data indicate that heterochromatin alterations are not a causative factor in transformation. The C band technique facilitated the analysis of the marker chromosomes.

- 6729 SMOKING HABITS AND HISTOLOGICAL CHARACTERISTICS OF ORAL LEUKOPLAKIAS IN DENMARK AND HUNGARY. (E.) Roed-Petersen, B. (U. Hosp., Copenhagen, Denmark), J. Banoczy and J. J. Pindborg. *Br J Cancer* 28(6):575-579, 1973.

The histological characteristics of oral leukoplakia were studied in relation to the smoking habits of 345 Danish and 184 Hungarian leukoplakia patients. No significant relationship between smoking habits and keratinization, epithelial thickness, epithelial dysplasia, or inflammation was found. However, nonsmokers were more likely to show hyperorthokeratosis, while smokers were more likely to show hyperparakeratosis. Similarly, the smokers showed a higher frequency of moderate to severe inflammation as compared with the nonsmokers.

- 6730 AUTORADIOGRAPHIC STUDIES ON INTRACELLULAR DISTRIBUTION OF ³H-LABELLED URETHAN IN TISSUES OF SWISS STRAIN MICE. (E.) Chavan, B. G. (Cancer Res. Inst., Tata Mem. Ctr., Bombay, India) and S. V. Bhide. *Indian J Cancer* 10(3):312-316, 1973.

³H-labeled urethan was injected s.c. into newborn Swiss mice and i.p. into adult mice, after which the intracellular distribution of the label in the lung and liver tissues was studied autoradiographically. The concentration of label was greater in the cytoplasmic areas than the nuclear areas in the adult liver tissue and the neonatal liver and lung tissues. The ratio of cytoplasmic to nuclear label was higher in the neonatal lung tissue than in the neonatal liver tissue. The data support the contention that the sum total of label binding with DNA, RNA, and protein in the cytoplasmic region was greater than in the nuclear region.

- 6731 CARCINOGENIC NITROGEN COMPOUNDS. PART LXXXIII. NEW CONDENSED ACRIDINES DERIVED FROM BENZ[e]INDENO[1,3-mn]-, BENZ[c]INDENO[1,3-kz]-, AND PHENOANTHRO[9,10,1-mna]-ACRIDINES. (E.) Jacquignon, P. (Inst. Chem. Natural Elements, Gif-sur-Yvette, France) and O. Perin-Roussel. *J Chem Soc* 20:2311-2313, 1973.

- 6732 EXPERIMENTAL AND CLINICO-PATHOLOGICAL STUDIES OF THE INFLUENCE OF GESTAGEN AND ESTROGEN ON THE CARCINOGENESIS AND DEVELOPMENT OF ENDOMETRIAL ADENOCARCINOMA. (Jap.) Taki, I. (Fac. Med. Kyushu U., Japan), S. Tanaka, Y. Hamasaki and T. Yoo. *Jap J Cancer Clin* 19(2):118-130, 1973.

6733 ISOLATION OF BENZ(a)PYRENE - NUCLEIC
ACID (tRNA AND DNA) COMPLEXES. (It.)

Vescia, A. (Inst. Tumor Res. Therapy, Naples,
Italy), G. Hermann and G. G. Giodano. *Quanderni*
de "La Ricerca Sci" (57):90-91, 1970.

See also:

- * (Rev): 6605, 6630, 6632, 6654, 6664
- * (Viral): 6761
- * (Immun): 6784, 6817, 6818
- * (Path): 6845, 6860
- * (Epid-Biom): 6881

- 6734 ATYPICAL FIBROXANTHOMA AND IONIZING RADIATIONS. (Fr.) Civatte, J. (No affiliation), G. Tsoitis, S. Belaich and C. Billaud. *Bull Soc Fr Dermatol Syphiligr* 80(4):407-410, 1973.

Case reports are presented for two women, aged 66 and 73 yr, resp., with atypical fibroxanthomas. The younger woman developed a tumor in the pubic region 15 yr after she received radiotherapy for cervical cancer. The older woman developed radio-dermatitis on the face following therapy for tuberculous lupus. The fibroxanthoma developed 60 yr later, an unusually long latent period. Both of the tumors were characterized by histiocyte proliferation, the abundance of giant multinucleated cells, and xanthomatous cells.

- 6735 RADIATION-INDUCED ABERRATIONS IN ANEUPLOID vs. DIPLOID SWINE LEUKOCYTES. (E.) McFee, A. F. (U. Tennessee, Oak Ridge), M. N. Sherrill and M. W. Banner. *Mutat Res* 18(3):311-314, 1973.

Blood samples taken from 18 Duroc pigs at two different times were exposed to 100, 200, 300, or 400 R of γ -radiation. Leukocyte cultures were then established from each sample, and the first-metaphase cells were harvested from these cultures. Based on the cells with 36 or 37 centromeres, there were more chromosome aberrations among the hypodiploid cells than among the diploid metaphases. When the blood samples were exposed to levels of 100 to 400 R, their aneuploidy levels were consistently increased, and a higher proportion of chromosomal deletions in cells with 36 or 37 centromeres were evident at all levels. The distribution of dicentric and ring aberrations was somewhat erratic. Thus, since aneuploid cells have higher aberration rates than diploid cells, the exclusion of the former by researchers during the scoring of chromosome aberrations gives a false measure of aberration induction.

- 6736 NODULAR FORMATIONS IN THE RAT SMALL INTESTINE AFTER LOCAL ABDOMINAL X-IRRADIATION. (E.) Tsubouchi, S. (Aichi Cancer Ctr. Res. Inst., Nagoya, Japan) and T. Matsuzawa. *Cancer Res* 33(12):3155-3158, 1973.

The abdominal areas of males and female Wistar rats were exposed to 1000, 1500, 1750, or 2000 rads irradiation. Fifty to 70 days later, a large number of small nodules were found in the small intestines of the animals exposed to 1500, 1750, or 2000 rads; the incidence of nodule formation was 80 to 100% in the animals receiving the two higher doses of irradiation and about 50% in the animals exposed to 1500 rads. A nodule incidence of 3% was noted in the rats exposed to 1000 rads. The nodules grew for 30 to 40 days post-irradiation, maintaining a peak size thereafter. They were composed of atypical glandular epithelial cells and avascular fibrous tissue. The epithelial cells of the glandular tissue invaded the submucosal, muscular, and serosal layers and the invaded epithelial area occasionally showed

adenomatous hyperplasia. It is possible that the process of nodule formation is a condition which leads to tumorigenesis.

- 6737 POST RADIATION BONE SARCOMA. (E.) Potdar, G. G. (Tata Mem. Hosp., Parel, Bombay, India) and S. S. Shrikhande. *Indian J Cancer* 10(3):361-365, 1973.

The occurrence of radiation induced osteogenic sarcoma in a 24-yr-old female is reported. The tumor appeared on the tibia several years after the patient underwent radiation therapy (220 Kv) for benign giant cell tumor of the knee. Histologically, the sarcoma consisted of large polygonal and elongated cells, with mitotic figures and occasional giant cells. In places, the tumor cells were seen forming osseoid tissue, and the adjacent bone tissue showed changes of radiation osteitis. Benign giant cell tumors which become malignant without radiation show a continuous process from benign to malignant, while those which become malignant following radiation treatment are characterized by an asymptomatic period of a few yr before the symptoms of malignancy are noted. The prognosis is better with post-radiation sarcomas, which should be treated by surgical ablation.

- 6738 PULMONARY NEOPLASMS IN RATS IN CHRONIC INHALATION OF TORIUM DIOXIDE. (Rus.) Likhachev, Ju. P. (USSR Acad. Med. Sci., Moscow), P. P. Lyarsky and L. T. Elovskaya. *Vopr Onkol* 19(11):47-54, 1973.

- 6739 PHOSPHOLIPID METABOLISM AND THE INVOLVEMENT OF MEMBRANES IN THE PROMOTION OF TUMOR FORMATION IN MOUSE SKIN. (E.) Rohrschneider, L. R. (U. Wisconsin, Madison). *Dis Abstr Int* 34(2):729B, 1973.

- 6740 THE LET FACTOR IN MUTAGENESIS BY IONIZING RADIATIONS. I. REVERSION TO WILD TYPE OF A BACTERIOPHAGE T4 AMBER MUTANT. (E.) Munson, R. J. (Med. Res. Council, Radiobiol. Unit, Berkshire, United Kingdom) and B. A. Bridges. *Int J Radiat Biol* 24(3):257-273, 1973.

- 6741 MALIGNANT HEMANGIOENDOTHELIOMA IN AN IRRADIATED RAT. (E.) Talerman, A. (Inst. Radiotherapy, Rotterdam, Holland). *Vet Pathol* 9(6):471-474, 1972.

- 6742 CYCLIC VARIATIONS IN KILLING AND "PETITE" MUTAGENESIS INDUCED BY ULTRAVIOLET LIGHT IN SYNCHRONIZED YEAST STAINS. (E.) Chanet, R. (Natl. Inst. Med. Res., London, England), D. H. Williamson and E. Moustacchi. *Biochim Biophys Acta* 324:290-299, 1973.

6743 A CASE OF CHONDROSARCOMA OF THE RIB
DEVELOPED 17 YEARS AFTER POSTMASTECTOMY
IRRADIATION. (*Jap.*) Masuda, H. (Natl. Kyushu
Cancer Ctr. Hosp., Japan), Y. Nomura, A. Horie
and H. Moriwaki. *Jap J Cancer Clin* 19(7):806-
811, 1973.

6744 EPIDERMAL CHANGES INDUCED BY β -RADIA-
TION. AN ULTRASTRUCTURAL STUDY. (*E.*)
de Rey, B. M. (Radiobiol. Dept., Natl. Commission
on Atomic Energy, Buenos Aires, Argentina) and
R. L. Cabrini. *J Submicro Cytol* 5(3):157-167,
1973.

See also:

- * (Rev): 6646
- * (Epid-Biom): 6902, 6911, 6914

- 6745 ABSENCE OF AMINONUCLEOSIDE-SENSITIVE STEPS IN THE CELL CYCLE OF SV40-TRANSFORMED HUMAN FIBROBLASTS. (E.) Gierthy, J. F. (Jefferson Med. Coll., Thomas Jefferson U., Philadelphia, Pa.) and G. P. Studzinski. *Cancer Res* 33(11):2673-2676, 1973.

The effects of aminonucleoside on the proliferation of WI38 and WI26 cells derived from human embryonic lung were determined and compared with the effects on the SV40 transformants of these cells, WI38-VA13 and WI26-VA4. Within 24 hr of aminonucleoside treatment (30 µg/ml), the normal fibroblast cultures ceased to proliferate; the transformed cells continued to proliferate but at a reduced rate. Similar results were seen when the cultures were treated with 100 µg/ml aminonucleoside, although the normal fibroblasts stopped proliferating earlier and the rate of proliferation in the transformed cells was reduced even further (to 40% the rate in the untreated cultures). The aminonucleoside had no detectable effect on the entry of the transformed cells into mitosis and into DNA synthesis, but it did accelerate the rate of detachment of these cells from the growth surface. These differences were not due to an altered rate of penetration of the membranes of the transformed cells by aminonucleoside. It is concluded that neoplastic transformation appears to liberate normal fibroblasts from aminonucleoside-sensitive steps in the G₁ and G₂ phases of their life cycle.

- 6746 ISOLATION OF AN RD-114 RELATED TYPE-C VIRUS FROM FELINE SARCOMA VIRUS-TRANSFORMED BABOON CELLS. (E.) Todaro, G. J. (Nat'l. Cancer Inst., Bethesda, Md.), S. S. Tevethia and J. L. Melnick. *Intervirology* 1(5-6):399-404, 1973.

The antigenic properties of a baboon cell line transformed by feline sarcoma virus (FeSV) which produced a type-C virus were investigated. The reverse transcriptase being made by the baboon cells was related to that of the endogenous cat (RD-114/CCC) type C-group and not to that of the FeLV group. Rabbit anti-RD-114 polymerase IgG (50 µg), caused greater than 70% inhibition of the polymerase produced by the type-C virus. Control rabbit IgG as well as anti-woolly monkey type-C polymerase and anti-FeLV polymerase did not inhibit the enzyme activity. To test whether the transformed baboon cells contained two different helper viruses, the standard FeLV and the endogenous cat type-C virus, supernatant fluids were filtered and used to infect both cat and primate, including human cells. Type-C virus grew rapidly on the human cells and the rhesus monkey cells, and the supernatant fluids, when concentrated and tested for reverse transcriptase activity, showed the antigenic properties of the RD-114/CCC virus group. No evidence of FeLV polymerase was found. In testing the infected human cells in the radioimmunoassay for gs antigen, only RD-114 gs 1 could be detected. Thus these results indicate that a type-C virus related to the RD-114/CCC virus group was isolated from a culture of feline sarcoma virus-transformed

baboon cells. The preferred host range of the RD-114/CCC virus group includes human cells and it would therefore appear that these viruses may be a potential biohazard to man and other primates. No overt disease has as yet been produced.

- 6747 FURTHER STUDIES ON ANTIBODIES TO EARLY ANTIGENS INDUCED BY EPSTEIN-BARR VIRUS IN NASOPHARYNGEAL CARCINOMA PATIENTS. (E.) Ida, S. (Tohoku U. Sch. Dent., Japan), Y. Hinuma, C.-T. Chu, J.-F. Chiou, J.-G. Lai, C.-S. Yang, T.-C. Lynn, M.-M. Hsu, S.-M. Tu and A. Kawamura, Jr. *Gann* 64(6):545-553, 1973.

Anti-EA, the antibodies against early antigens (EA) induced by Epstein-Barr (EB) virus, was titrated in 244 sera of 190 patients with nasopharyngeal carcinoma (NPC), and of the control groups; 45 patients with other ear, nose, and throat (ENT) diseases, 107 patients with cancer outside the head and neck region, and 101 healthy people. The results revealed that the geometric mean titer (GMT) of anti-EA in patients with NPC was high (1:93.5), and the positive rate of that was also significantly higher than those of the control groups (88.1%). The positive rate of anti-EA in NPC patients before treatment (88.8%) was about the same as that after treatment (84.1% to 86.6%), but higher in patients with recurrence (100.0%). On the other hand, GMT reduced to 1:68.3 and 1:72.9 in patients after treatment, although it was 1:111.8 in patients before treatment, and rose to a significantly high level, 1:166.6, in patients with recurrence. Meanwhile, patients with some other ENT diseases and malignancies also showed higher incidences of positive rate (5.6% to 18.2%) than that of healthy people (2.0%), but these were still far less than that of NPC patients. The results suggested that the anti-EA may be associated with the progress of NPC.

- 6748 A HUMAN PAPOVAVIRUS (B.K.), BIOLOGICAL PROPERTIES AND SEROEPIDEMIOLOGY. (E.) Mäntyjärvi, R. A. (Dept. Virol., U. Turku, Finland), O. H. Meurman, L. Vihma and B. Berglund. *Ann Clin Res* 5(5):283-287, 1973.

A survey of B.K. virus HA-inhibiting antibodies in 203 patients of different age groups revealed that the virus is a relatively common infective agent in Finland. In children 10 yr of age or younger, the antibody frequency was over 60%. In an attempt to characterize clinical manifestations of B.K. virus infection, serial serum samples of 66 children were tested for B.K. virus antibodies. B.K. virus infection was found in 11 cases as indicated by an antibody rise. No specific illness had been recorded in these children at the time of the appearance of the antibodies. In four cases there had been a mild respiratory illness of unknown etiology, but the causal relation of the B.K. virus remained uncertain. Thirty-two of the children tested, including six who had a B.K. virus infection, lived under

constant surveillance in a residential nursery. It was concluded that primary B.K. virus infection resulted in most cases in a subclinical or in a common, mild, nonspecific illness. However, the possibility remains that chronic, perhaps neurological, form of B.K. virus illness exists.

- 6749 INDUCTION OF ANTINUCLEAR ANTIBODIES IN MICE INOCULATED WITH RAUSCHER LEUKEMOGENIC VIRUS: POSSIBLE ROLE OF GENETIC FACTORS IN "NON-NEW ZEALAND" STRAINS. (E.) Cannat, A. (St. Louis Hosp., Paris, France) and B. Varet. *Immunol Commun* 2(6):527-534, 1973.

Mice belonging to strains with a low incidence of spontaneous antinuclear antibodies (C 57 Bl/6, BALB/c, C3H/eb and their F1 hybrids and backcrosses) were inoculated with a given dose of Rauscher leukemogenic virus (RLV). The incidence of antinuclear antibodies detectable by immunofluorescence (ANF) was significantly increased two months after inoculation in c/B6 and C3H/B6 F1 hybrids, but not in C3H/c hybrids or in the three parental strains. These findings demonstrate the significance of genetic factors in ANF induction by RLV and show that at least two genes are implicated with a synergistic addition in some but not all hybrids. ANF incidence in backcrosses of c/B6 with their parental strains were in good correlation with the incidences expected in the hypothesis of three or more genes. Present findings confirm that ANF and tumor induction should be considered as two distinct consequences of infection with oncogenic viruses. After 4 months a significant rise in ANF incidence occurred in c and C3H/c mice, but not in C3H, further emphasizing the importance of strain differences and chronic infection and also demonstrating the existence of several levels of genetic predisposition in the parental strains used in this study. It is suggested that the dominant additive trait evidenced in this study for RLV has a part in viral infection with oncogenic viruses of the FMR G1 group.

- 6750 MODES OF EPSTEIN-BARR VIRUS INFECTION IN HUMAN FLOATING CELL LINES. (E.) Sairenji, T. (Kumamoto U. Med. Sch., Japan) and Y. Hinuma. *Gann* 64(6): 583-590, 1973.

Five human floating cell lines, P3HR-1, QIMR-WIL, OAT, C-6 and Daudi were examined for susceptibility to superinfection with Epstein-Barr (EB) virus produced from the P3HR-1 cells. Formation of EB virus-associated early (E) antigen inducible by treatment with 5-iododeoxyuridine was demonstrated in four cell lines but not in the QIMR-WIL line. The P3HR-1 cells had no capacity to adsorb the virus. The other four lines showed adsorption of the virus. The infected OAT and C-6 lines yielded E antigen-producing cells but only few viral capsid (VC) antigen-producing cells. Both E and VC antigens were demonstrated in about the same number of cells in the infected QIMR-WIL and Daudi lines. The percentage of antigen-positive cells in the

Daudi line was much higher than that of the QIMR-WIL line. This suggests that the Daudi line was the most permissive of the five cell lines responding in different modes to superinfection by EB virus.

- 6751 RESISTANCE OF HAMSTER CELLS TRANSFORMED BY HERPES SIMPLEX VIRUS TYPE 2 TO SUPERINFECTION BY HERPES SIMPLEX VIRUSES. (E.) Doller, E. (Milton S. Hershey Med. Ctr., Pennsylvania St. U., Hershey), R. Duff and F. Rapp. *Intervirolog* 1(3):154-167, 1973.

Cultures of hamster embryo fibroblasts originally transformed *in vitro* by herpes simplex virus (HSV) type 2 which had previously been irradiated with UV light were resistant to superinfection by HSV-1 and HSV-2. The degree of resistance was dependent upon the concentration of the superinfecting virus. At an MOI of 1.0 infectious virus particle per cell, little or no virus replication was detected. In normal hamster embryo fibroblasts, the virus replicated when either high or low MOIs were used. Early events in the virus-replicative cycle proceeded normally. The results suggest that HSV can initiate and complete the infectious cycle in a limited number of herpes-transformed cells, a finding similar to that observed for Epstein-Barr herpes-virus systems.

- 6752 CONTROL OF GENE EXPRESSION IN RAT CELLS TRANSFORMED BY A COLD-SENSITIVE MURINE SARCOMA VIRUS (MSV) MUTANT. (E.) Somers, K. D. (Baylor Coll. Med., Houston, Texas), J. T. May and S. Kit. *Intervirolog* 1(3):176-184, 1973.

The control of murine sarcoma virus (MSV) genetic information in rat cells transformed by a cold-sensitive MSV mutant was examined. Expression of the transformed phenotype by cells after a shift from the non-permissive (33 C) to the permissive temperature (39 C) was not prevented by inhibitors of DNA and RNA synthesis but was prevented by inhibitors of protein and glycoprotein synthesis. Similar amounts of viral-specific RNA, measured by RNA-DNA hybridization, were found in cells grown at the permissive or nonpermissive temperature. The results suggest that the expression of transformation involves translational and possibility post-translational, but not transcriptional control.

- 6753 CHARACTERISTICS OF INFECTION BY RSV. I. NON-REQUIREMENT FOR THE S PHASE OF CELLULAR DNA SYNTHESIS. (E.) Golde, A. (Curie Fdn., Inst. Radium, Fac. Sci., Orsay, France), J. Aghion and J. Villaudy. *Intervirolog* 1(4):242-249, 1973.

The relationship between the position of chick embryo fibroblasts in the mitotic cycle and their susceptibility to infection by B-RSV (RAVI) was studied in synchronized cultures. The pattern of virus growth was similar in cultures infected at various times during the mitotic cycle. Notably, first virions were released after comparable delays in cultures infected

before, during or after the S phase, and the virus production was identical when measured up to 48 hr after infection. Latent periods extended from 8 to 15 hr according to the experiment. Identical results were obtained with both calf sera used to induce mitoses. These results show that the S phase of cellular DNA synthesis is not required at some early stage of the viral cycle and suggest that there is no obligatory relationship between RSV production and the cell cycle.

- 6754 DEOXYTHYMIDINE KINASE FROM RABBIT KIDNEY CELLS INFECTED WITH HERPES SIMPLEX VIRUS TYPES 1 AND 2. (E.) Ogino, T. (Coll. Med., Milton S. Hershey Med. Ctr., Pennsylvania St. U., Hershey), R. Shiman and F. Rapp. *Intervirolog* 1(2):80-95, 1973.

Deoxythymidine kinase (TdR kinase) from rabbit kidney cells infected *in vitro* with herpes simplex virus type 1 (HSV-1) or type 2 (HSV-2) was studied. The enzyme activity induced by HSV-2 was more heat-labile and more sensitive to inhibition by deoxythymidine nucleotides than was HSV-1 induced enzymic activity in both crude extracts and partially purified preparations. The thermostability of TdR kinase activity from cells coinfecting with HSV-1 and HSV-2 was intermediate between enzymes induced separately. The difference in thermostability between the two enzyme activities was also observed in extracts from 1- β -D-arabinofuranosylcytosine (ara-C) treated infected cells. HSV-1 and HSV-2 induced enzymes also differed in their response to substrate concentration. Gel filtration with Sephadex G-100 revealed the presence of monomer, dimer and aggregated forms of HSV-1 induced enzyme. The molecular wt of the monomer and dimer were estimated to be 58,000 and 97,000, resp. Such multiple forms were not observed with HSV-2; the molecular wt of the HSV-2 induced enzyme was estimated to be 45,000 to 60,000, depending upon the eluting buffers. HSV-1 induced TdR kinase activity showed a different electrophoretic activity pattern in polyacrylamide gel electrophoresis than did the enzyme induced by HSV-2.

- 6755 *IN VIVO* BEHAVIOR OF A TEMPERATURE-SENSITIVE (ts) MUTANT OF HERPESVIRUS HOMINIS TYPE 2. (E.) Zygraich, N. (Biol. Dept., Recherche et Industrie Therapeutiques, Rixensart, Belgium) and C. Huygelen. *Arch Gesamte Virusforsch* 43(1-2):103-111, 1973.

Three ts mutants derived from herpesvirus hominis type 2 were inoculated into rabbits and mice. Intradermal or i.m. inoculation failed to induce any nervous symptoms in rabbits, whereas the parent virus strain showed marked neuropathogenicity. Although no detectable circulating antibodies developed as a result of the inoculation of the mutants, the animals showed a high degree of protection against a subsequent challenge with virulent virus. This protection was more marked in those animals which had received the ts mutants by the intradermal route. In mice also, peripheral inoculation of a ts mutant resulted in a morbidity markedly lower than that caused by the parent strain. Intradermal inoculation of the ts

strain provided complete protection against a subsequent challenge with virulent virus either by the intracerebral or by the intradermal route. I.m. inoculation gave partial protection.

- 6756 AGGLUTINABILITY OF ROUS CELLS BY CON-CAVALIN A: STUDY WITH A TEMPERATURE-SENSITIVE RSV MUTANT AND INHIBITORS OF MACROMOLECULAR SYNTHESIS. (E.) Biquard, J.-M. (Inst. Radium, Fac. Sci., Orsay, France). *Intervirolog* 1(3):220-223, 1973.

Doses of puromycin or cycloheximide which prevent morphological transformation (following a temperature shift from 41 to 37 C) of chick embryo cells infected with the temperature-sensitive mutant FU 19 of the Rous sarcoma virus(D) do not prevent the increase of cell agglutinability by concanavalin A which normally parallels transformation. Hence, cell transformation and agglutinability may depend on the expression of distinct viral information. Or, alternatively, they could depend on different levels of expression of the same information.

- 6757 THE WIRL-3 RAT LIVER CELL LINES AND THEIR TRANSFORMED DERIVATIVES. (E.) Diamond, L. (Wistar Inst. Anat. Biol., Philadelphia, Pa.), R. McFall, Y. Tashiro and D. Sabatini. *Cancer Res* 33(11):2627-2636, 1973.

Two epithelial cell lines were established from the liver of a weanling rat. The cells retained their epithelial morphology after transformation by simian virus 40. They also transformed spontaneously and grew to higher cell densities than the parent cultures or grew in suspension. The "normal" and transformed cell lines have some but not all the characteristics associated with hepatocytes. They exhibit glucose 6-phosphatase activity, secrete serum globulin, and, in confluent monolayers, show tight cell junctions and intercellular canaliculi resembling bile canaliculi. On the other hand, the cells have low levels of inducible tyrosine aminotransferase, no detectable δ -aminolevulinic acid synthetase, and aryl hydrocarbon hydroxylase activity that is inducible with benz(a)anthracene but not phenobarbital. The morphologically transformed cell lines produce tumors in the hamster cheek pouch, and a suspension culture derived from one of the lines produces ascites and solid tumors when inoculated i.p. into rats. These tumors resemble hepatomas.

- 6758 CATABOLISM OF NUCLEAR PROTEINS IN CONTROL AND PHYTOHEMAGGLUTININ-STIMULATED HUMAN LYMPHOCYTES, LEUKEMIC LEUKOCYTES, AND BURKITT LYMPHOMA CELLS. (E.) Weisenthal, L. M. (U. Michigan Med. Sch., Ann Arbor) and R. W. Ruddon. *Cancer Res* 33(11):2923-2935, 1973.

Sodium dodecyl sulfate (SDS)-polyacrylamide gel electrophoresis of nuclear non-histone proteins extracted with 0.15 and 0.30 M NaCl from human normal

lymphocytes or leukemic leukocytes indicated a lack of bands in the higher-molecular-wt regions of the gels. However, the corresponding fractions from phytohemagglutinin-stimulated lymphocytes and Burkitt lymphoma cells did contain high-molecular-wt protein bands. Moreover, high-molecular-wt bands were present in the non-histone protein fraction extracted with 1% SDS:4 M urea ("tightly bound" non-histone protein) from all types of cells studied, but proliferating cells were found to contain significantly greater amounts of protein in the 1% SDS:4 M urea fraction than were present in largely nonproliferating cells. Nonstimulated normal lymphocytes and leukemic leukocytes were found to have a nuclear-associated protease activity that was capable of markedly degrading proteins in Burkitt lymphoma cell nuclei within 2 hr at 0-4 C (pH 7.2). The susceptibility of the Burkitt lymphoma cell nuclear proteins to protease degradation decreased in the following order: 0.15 M NaCl-extractable proteins \geq 0.30 M NaCl-extractable proteins > F1 histone > other histones > 1% SDS:4 M urea-extractable proteins. Assays of protease and phosphatase activity in isolated nuclei demonstrated the following: 10% of the nuclear protein in Burkitt lymphoma cells was rendered acid soluble during a 2-hr incubation at 37 C (pH 7.5); 20 to 90% of the nuclear protein in normal lymphocytes and leukemic leukocytes was rendered acid soluble under the same conditions; phytohemagglutinin (1000 μ g/ml) substantially reduced protein hydrolysis in this system; and 3 H was rendered acid soluble at a rate comparable to that of 32 P in nuclei from normal lymphocytes that had been prelabeled with ATP- γ - 32 P and 3 H-labeled amino acids. However, 3 H was rendered acid soluble at a much slower rate than 32 P in nuclei isolated from Burkitt lymphoma cells. It is concluded that proteases may have an important role in regulating the content and function of nuclear proteins.

- 6759 SENESCENT LOSS OF RESISTANCE TO MURINE SARCOMA VIRUS (MOLONEY) IN THE MOUSE. (E.) Pazmino, N. H. (U. Tennessee-Oak Ridge Grad. Sch. Biomed. Sci.) and J. M. Yugas. *Cancer Res* 33(11):2668-2672, 1973.

Sensitivity to the induction of sarcomas following the injection of the Moloney strain of murine sarcoma virus (MSV-M) was studied in BALB/c X DBA/2 F₁ mice between birth and extreme old age (3 yr). In accord with previously published information, a loss of sensitivity was demonstrated by the time young adulthood is attained; it is at a maximum in neonates. However, sensitivity reappears by 1 yr of age and becomes progressively more severe with advancing age. At the oldest ages tested, 2.5 to 3 yr, BALB/c X DBA/2 F₁ mice are as sensitive as newborns, i.e., 100% develop progressively growing tumors. This age-dependent sensitivity was reflected by the development of specific neutralizing antibody. The resistant young adults developed a serum antibody which reacted specifically with the virus and which was able to neutralize the oncogenic effects of the MSV-M. Following MSV-M injection, the sensitive newborn and aged mice did not develop this antibody in sufficient concentration to be de-

tected by our tests, nor did mice of any age that were not virus-injected demonstrate this antibody. It is proposed, therefore, that the age-dependent reappearance of sensitivity to MSV-M results from a similar age-dependent decay of the humoral immune capacity.

- 6760 ISOLATION OF ONCORNAVIRUSES (TYPE B) FROM TRANSPLANTED HUMAN CELLS. (Rus.) Bykovskii, A. F. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR), G. G. Miller, I. S. Irlin, T. F. Lozinskii, G. N. Dotsenko and V. M. Zhdanov. *Vopr Onkol* 19(12):37-41, 1973.

Viruses identified morphologically as type A and B oncornaviruses were isolated from two sublines of human embryonic kidney cells, human amniotic cells (AI, AO, FL), human embryonic skin-muscle cells and Detroit 6 cells by labeling with 3 H-uridine and centrifuging in a linear sucrose gradient (20-60%). These virions formed a peak of radioactivity at a density of 1.16-1.17 ml (sic!); this peak did not form in cultures treated with actinomycin D. The RNA contained one component with a sedimentation constant of 60-70S and components with constants from 4 to 50S. The reverse transcriptase test was positive. These biophysical, biochemical and morphological findings confirm that the agents isolated were oncornaviruses. It is not known whether the presence of oncornaviruses in these cell lines is due to their human origin or the type of cell differentiation or whether these viruses are generally present in mammalian cells. The possibility that these viruses came from calf serum or swine trypsin cannot be ruled out.

- 6761 ENHANCEMENT OF ADENOVIRUS TRANSFORMATION OF HAMSTER CELLS BY N-METHYL-N'-NITRO-N-NITROSOGUANIDINE, CAFFEINE, AND HYDROXYLAMINE. (E.) Ledinko, N. (Dept. Biol., U. Akron, Ohio) and M. Evans. *Cancer Res* 33(11):2936-2938, 1973.

Three known mutagens that produce chromosomal aberrations, N-methyl-N'-nitro-N-nitrosoguanidine, caffeine, and hydroxylamine, enhanced the frequency of adenovirus transformation when added to hamster embryo cells infected with oncogenic human adenovirus type 12. Significant increases in the final numbers of virus-transformed cell foci were observed after 2×10^5 infected cells were treated with 0.5 μ g N-methyl-N'-nitro-N-nitrosoguanidine, 30 μ g hydroxylamine, or 150 μ g caffeine. The data suggest that a similar underlying mechanism is involved in the effect of these agents on cellular transformation by different adenoviruses.

- 6762 PRELIMINARY ELECTRON MICROSCOPE STUDY ON VIRUS-LIKE PARTICLES IN A SPONTANEOUS MAMMARY TUMOR OF COLLARED LEMMING. (E.) Hiraki, S. (U. Texas System Cancer Ctr., Houston), R. W. Van Pelt and L. Dmochowski. *Cancer* 33(12):3159-3164, 1973.

An electron microscopic study of a spontaneous mammary tumor (diagnosed histologically as adenocar-

cinoma) in a collared lemming was undertaken to search for particles resembling oncogenic RNA virus particles. The presence of a large number of characteristic virus-like particles was demonstrated. The virus-like particles were similar to the hamster type H virus particles in morphology and intracisternal cytoplasmic location, resembling those previously observed in some mouse mammary tumors and human breast cancer. These particles were found budding from and free within the cisternae of the rough endoplasmic reticulum. They measure 1450 Å average outer diameter with small nucleoids of 700 Å diameter. Normal mammary gland tissues of collared lemmings were also examined in the electron microscope. However, no virus-like particles could be found in any of these tissues. Whether these virus-like particles are etiologically related to the mammary tumors of collared lemmings or are merely passenger agents remains to be determined.

6763 TEMPERATURE SENSITIVE CELLS IN THE STUDY OF SV40 LYSIS VERSUS SV40 TRANSFORMATION.

(E.) Naha, P. M. (Natl. Inst. Med. Res., London, Great Britain). *Exp Cell Res* 80(2):467-473, 1973.

Temperature sensitive variant clones of the African green monkey kidney cell line BSC-1 were isolated. They were defective in thymidine metabolism and showed a high frequency of transformation by SV40 at 39.5 C: they were lytic to SV40 infection at 33 C. Virus adsorption tests with two of the variant clones indicated that these lines had virus receptors on the cell surface. Indirect immunofluorescence test indicated that the parent line as well as the two variant lines were positive for both V and T antigens at 33 C. However, at 39.5 C, the parental line was positive for both antigens, while one variant clone was negative for V antigen and the other was negative for both antigens. Both the parental line and the two variant clones were strongly contact inhibited between 33 and 39.5 C. The viability of the variant cells fell sharply after incubation for 24 hr at 39.5 C. The SV40 transformation frequencies in the variant clones were dependent on the multiplicities of infection with SV40. The data suggest a possible relationship between T antigen production, temperature independence, cell proliferation, and loss of contact inhibition.

6764 HOST AGE DEPENDENCY OF REGRESSION OF ROUS SARCOMAS OF CHICKENS. (E.) Cotter, P. F.

(Dept. Animal Sci., U. New Hampshire, Durham), W. M. Collins, W. R. Dunlop and A. C. Corbett. *Cancer Res* 33(12):3310-3311, 1973.

Tumors were induced in Regional Poultry Research Laboratory line 6 chickens inoculated in the wing web with the Bryan high-titer strain pseudo-type Rous sarcoma virus at 1, 14, and 28 days of age. Tumor regression failed to occur in chicks inoculated at 1 and 14 days of age, but a 50% incidence of regression was observed in chicks inoculated at 28 days of age. Chick survival time postinoculation and the incidence of visceral metastases were directly related to chick age at inoculation. The age-dependent

changes in the incidence of regression and metastases probably were associated with the developing immunological maturity of the host.

6765 REPLICATION OF AN AVIAN MYXOVIRUS IN PRIMARY CULTURES OF HUMAN LEUKEMIC CELLS. (E.)

Sauter, C. (Dept. Med., U. Zurich, Switzerland), U. Baumberger, S. Ekenbark and J. Lindenmann. *Cancer Res* 33(11):3002-3007, 1973.

The replication of a strain of fowl plague virus adapted to human myeloblasts was studied in leukemia cell cultures derived from the venous blood of 20 adult patients suffering from acute leukemia (15 acute myelogenous, 4 acute lymphatic, and 1 chronic myelogenous leukemia in acute blastic crisis). Virus multiplication was observed in the cultures of 18 patients. Sufficient adaptation of the virus and a high number of nucleoli per leukemic cell seemed important for good virus replication. In acute myelogenous leukemia, hemadsorption, coupled with staining for peroxidase, revealed that virus replication indeed took place in the leukemic cells, a prerequisite for immunotherapy in leukemia patients with viral oncolysates.

6766 BIOCHEMICAL PROPERTIES OF A DEFECTIVE HAMSTER C-TYPE ONCORNAVIRUS. (E.) Somers,

K. D. (Baylor Coll. Med., Houston, Tex.), J. T. May, S. Kit, K. J. McCormick, G. G. Hatch, W. A. Stenback and J. J. Trentin. *Intervirology* 1(1):11-18, 1973.

A noninfectious hamster C-type oncornavirus (D9) associated with a spontaneous hamster lymphoma was characterized. The D9 cells produced ³H-uridine labeled viral particles with a buoyant density of 1.16-1.17 g/cm³. RNA extracted from the D9 cells sedimented between 60 and 70S and had a base composition closely resembling that of the 60-70S RNA extracted from murine sarcoma virus-Moloney leukemia virus transformed rat kidney cells. With both endogenous and added templates, the D9 virions were deficient in DNA polymerase activity. Similarly, the D9 virus showed no demonstrable biological activity. The data support the hypothesis that viral DNA polymerase is essential for both infection and transformation by RNA tumor viruses.

6767 PARTIAL PURIFICATION AND BIOLOGICAL AND SEROLOGICAL CHARACTERIZATION OF CARBOHYDRATE-CONTAINING COMPONENTS IN PREPARATIONS OF FRIEND'S LEUKEMIA VIRUS. (Ger.) Moennig, V. (Max Planck

Inst. Virus Res., Tübingen, Germany), G. Hunsmann and W. Schäfer. *Z Naturforsch (B)* 28c(11/12):785-789, 1973.

Glycoproteins (G₁ and G₂) were isolated from bud-like structures on the surface of Friend's leukemia virus (FLV) and were partially purified by gradient-density in linear sucrose gradients (20-70%). Most of viral protein P₄ was removed from the glycoprotein fraction by dialysis at pH 7.2 and gel filtration through a Sephadex G 150 column. More P₄ was removed by dialysis against a 0.1 M Tris buffer (pH 7.8) and elution

from an ion-exchange column (DEAE A-50) by elution with 0-0.8 M NaCl in 0.1 M Tris HCl (pH 7.8). The concentrated glycoprotein fractions interfered with plaque production in a culture of FLV. These glycoproteins also contained type-specific and group-specific antigenic determinants. Hemagglutinating activity was found only in G₂ fractions. Some inter-specific antigenic determinants were also present. These probably occur in viral protein P₄ but it is also possible that they are associated with the reverse transcriptase of the virus. Normal antigens were found which reacted with rabbit antisera for normal fetal calf serum. These may be cross-reacting components of viral glycoprotein, but it is more likely that they are impurities.

- 6768 INHERITANCE OF SUSCEPTIBILITY TO FRIEND LEUKEMIA VIRUS IN MICE. (E.) Odaka, T. (Inst. Med. Sci., U. Tokyo, Japan). *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 275-277, 1973.

The Friend murine leukemia virus induces visible focal lesions on the spleen surface or marked splenomegaly in adult mice of most strains within a few wk after infection. Two types of splenomegaly, early and late types, occur in Friend virus infected mice according to their genotypes. The susceptibility to Rauscher leukemia virus as well as the spleen focus formation and splenomegaly induction which are characteristics of Friend leukemia are controlled by the *Fv* locus, with the allele responsible for susceptibility, *Fv^S*, being dominant over the allele for resistance, *Fv^R*. Cogenic mouse strains were established by introducing the *Fv^S* allele from susceptible DDD strain mice into the genetic background of resistant C57BL/6 strain mice, and by introducing the *Fv^R* allele from C57BL/6 into the genetic background of DDD. DDD and DDD-*Fv^R* were therefore cogenic except for the *Fv* locus. DDD-*Fv^R* invariably develop splenomegaly with 150 days after infection, while C57BL/6 never develop splenomegaly during the same period. Genetic experiments between these two strains indicated that virus growth on day 5 of infection is under the control of a single major autosomal locus, that high virus production is recessive, and that a single gene is responsible for the late development of splenomegaly. In the latter case, susceptibility is recessive, although heterozygous mice may develop splenomegaly under some conditions.

- 6769 SIMIAN VIRUS 40-HOST CELL INTERACTIONS. I. TEMPERATURE-SENSITIVE REGULATION OF SV40 T ANTIGEN IN 3T3 MOUSE CELLS TRANSFORMED BY THE *ts*101* TEMPERATURE-SENSITIVE EARLY MUTANT OF SV40. (E.) Robb, J. A. (Dept. Path., U. California, San Diego). *J Virol* 12(5):1187-1190, 1973.

BALB/3T3 and Swiss/3T3 mouse cells transformed at permissive temperature (33 C) by the early temperature-sensitive mutant of simian virus 40 (SV40), *ts*101*, exhibited a temperature-dependent modulation of SV40 tumor (T) antigen as assayed by immunofluorescence. The percentage of T antigen-positive nuclei in *ts*101* transformed cells was reduced at restrictive tempera-

ture (39 C) when compared to 33 C and to wild-type SV40 transformed cells at either 33 C or 39 C. The percentage of T antigen-positive nuclei in *ts*101* transformed cells returned to the 33 C control level when the cells were shifted from 39 to 33 C. The *ts*101* transformed cells could be superinfected with wild-type, but not *ts*101*, virions at 39 C as assayed by an increase in T antigen-positive nuclei. The data suggest that the regulation of T antigen in the transformed cells is mediated by the *ts*101* protein, a virion protein.

- 6770 DETECTION OF "C" TYPE-ONCORNAVIRUSES OF CATTLE WITH SPONTANEOUS AND WITH EXPERIMENTALLY INDUCED LYMPHATIC LEUKEMIA. (E.) Kukaine, R. A. (Inst. Microbiol., Acad. Sci. LSSR, Kleisti/UdSSR), L. I. Nagayewa, S. V. Tschapenko, O. I. Bratsslawskaya, M. A. Alexandrowa, E. M. Ustincowa, A. Y. Runtzis, G. O. Kudlewa, T. F. Schitova and S. S. Schashina. *Arch Geschwulstforsch* 42(4):263-273, 1973.

Virus particles measuring between 900 and 1200 Å were observed in ultrathin sections of biopsied lymphatic nodules from Latvian Brown cattle with spontaneous and experimentally induced leukemia. Similar particles were seen in tissue cultured leucocytes from the same animals. Particles isolated from the blood plasma of the cattle were centrifuged in potassium citrate linear gradient and showed a distinct peak in the 1.16 g/ml zone. Electron microscopic investigation of these particles by negative contrast staining indicated that in size and shape they resembled known oncornaviruses. An active linear reverse transcriptase reaction was obtained with purified and concentrated particles separated from the 1.16 g/ml potassium citrate gradient zone. Thus, the isolated particles resembled other known C-type oncornaviruses.

- 6771 THE SIGNIFICANCE OF LYMPHOCYTES IN THE ETIOLOGY OF EPSTEIN-BARR VIRUS-ASSOCIATED TUMORS: IMPLICATIONS FOR SEROLOGICAL EPIDEMIOLOGY. (E.) Yata, J. (Dept. Pediatrics, Toho U., Tokyo, Japan) and T. Tachibana. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 161-169, 1973.

While infectious mononucleosis, Burkitt's lymphoma, and nasopharyngeal carcinoma all seem to be associated with the Epstein-Barr (EB) virus, the antibody response to EB virus differs between infectious mononucleosis and the two malignant diseases. In infectious mononucleosis, the antibody level rises just after the illness and declines gradually after several months; the serum antibody remains at a high level in Burkitt's lymphoma and nasopharyngeal carcinoma. There are two different lymphocyte subpopulations in mice - those derived from the thymus (T cell) and those derived from the bone marrow (B cell). In humans, human thymus-lymphoid antigen and rosette formation with sheep erythrocytes are thought to be T cell markers, while the cell surface immunoglobulin is a well-documented marker of B cells. The cell lines established from Burkitt's lymphoma and naso-

pharyngeal carcinoma can be identified by these markers as being primarily B cells. In contrast, the lymphocytosis observed in infectious mononucleosis seems to be mainly due to an increase in the T cell population. It is proposed that in infectious mononucleosis, the T cells operate effectively to suppress the EB virus. However, they do not seem sufficient either quantitatively or functionally in tumor tissues of Burkitt's lymphoma or nasopharyngeal carcinoma to suppress the virus.

- 6772 LOCATION OF THE T4 GENE 32 PROTEIN BINDING SITE ON SIMIAN VIRUS 40 DNA. (E.) Morrow, J. F. (Stanford U. Med. Ctr., Calif.) and P. Berg. *J Virol* 12(6):1631-1632, 1973.

The T4 gene 32 protein, which binds to single-stranded but not duplex DNA, forms a specifically located denaturation loop in covalently closed circular simian virus 40 (SV40) DNA. The site-specific restriction endonuclease *Hemophilus parainfluenzae* was used to convert the gene 32 protein-SV40 DNA complexes to linear structures. The results indicated that the T4 gene 32 protein binds predominantly to the region of the SV40 DNA corresponding to 0.44 to 0.48 SV40 map unit. This is within one of the regions of the SV40 DNA which is cleaved preferentially by the single-strand-specific nuclease S_1 . Thus, in the SV40(I) DNA, this region appears to be partially denatured or easily denaturable.

- 6773 DEFECTIVE VIRIONS OF HERPES SIMPLEX VIRUSES. (E.) Bronson, D. L. (Baylor Coll. Med., Houston, Tex.), G. R. Dreesman, N. Biswal and M. Benyesh-Melnick. *Intervirology* 1(3):141-153, 1973.

Serial undiluted passage of clonally purified herpes simplex virus type 1 (HSV-1) and type 2 (HSV-2) in four different types of cells resulted in a partial loss (84-98%) of infectivity and the appearance of a new DNA within the infected cells with a higher buoyant density in CsCl ($\rho = 1.732 \text{ g/cm}^3$) than of HSV-1 (1.725 g per cm^3) or that of HSV-2 DNA (1.727 g/cm^3). Serial diluted passages of these stocks restored the high infectivity titers with a concomitant loss of the high density DNA within the infected cells. Serologic studies and electron microscopy indicated that the HSV stocks were not contaminated with an extraneous virus which might yield a DNA with the high buoyant density. Characterization of purified HSV from the serially passed undiluted stocks indicates that the high density DNA is a part of the HSV virion replicating under these conditions. The results obtained suggest the production of defective interfering particles after undiluted passage of HSV.

- 6774 LATENT VIRUS INFECTIONS IN PRIMARY MONKEY KIDNEY CULTURES. (E.) Litynska, J. (Dept. Virol., State Inst. Hygiene, Warsaw, Poland) and I. Polna. *Acta Microbiol Pol (A)* V(22)(3-4):244-250, 1973.

In the period 1969-1972 a total of 558 lots of kid-

ney cultures from monkeys (*Cercopithecus aethiops*) and baboons (*papio sp.*) were tested by virological methods. Changes in cell morphology were found in 94 cases (16.6 percent). The changes could be divided into three types: foamy-type (55 cases), foci of rounded granular cells (37 cases), and cytoplasmic vacuolization (2 cases). Two agents inducing vacuolization were identified as Simian virus 40 (SV40). Other factors which produced foamy-type cell changes were clinically apathogenic for laboratory animals, showed no HA or Had activity with monkey, guinea pig, and chicken erythrocytes, and did not interfere with polio and some ECHO viruses. They could not be fully identified. Of the two agents producing cell rounding, one was identified as adenovirus SA 7 (C-626) and another as SV15. Sera from 756 monkeys were tested by neutralization with SV40, and sera from 472 monkeys by HI and neutralization for measles antibody; 0.4 percent were positive with SV40, and 6.4 percent were positive with measles virus.

- 6775 ACTIVATION BY 5-BROMO-2'-DEOXYURIDINE OF PARTICLES RESEMBLING GUINEA-PIG LEUKEMIA VIRUS FROM GUINEA-PIG NONPRODUCER CELLS. (E.) Rhim, J. S. (Microbiol. Associates, Inc., Bethesda, Md.), F. G. Duh, H. Y. Cho, K. D. Wu and M. L. Vernon. *J Natl Cancer Inst* 51(4):1327-1331, 1973.

One-day-old cultures of nonproducer (NP) guinea-pig cells isolated from transformed foci induced by the Kirsten strain of murine sarcoma virus were exposed to varying doses of 5-bromo-2'-deoxyuridine (5-BUDR). By the fourth day after treatment, RNA-dependent DNA polymerase activity was observed in the treated cultures; this activity was barely detectable after 14 days. No murine leukemia virus group-specific antigen was detected by complement fixation. Numerous extracellular virus particles were seen in cultures treated with 5-BUDR alone or 5-BUDR and DMSO. These particles were approximately 100 μm in diameter and had a relatively thick poorly defined outer coat and a dense nucleoid, often somewhat eccentric. Immature extracellular forms were also seen occasionally. The mature particles had a density of 1.16-1.17 g/ml.

- 6776 CLINICAL EVENTS SUGGESTING HERPES-SIMPLEX INFECTION BEFORE ONSET OF BURKITT'S LYMPHOMA: A CASE-CONTROL STUDY IN WEST NILE, UGANDA. (E.) Dean, A. G. (Intl. Agency Res. Cancer, Lyons, France), E. H. Williams, G. Attobua, A. Gadi, J. Omeda, A. Amuti and S. B. Atima. *Lancet* 7804:1225-1228, 1973.

Thirty people with Burkitt's lymphoma and 30 controls matched for age and sex in the West Nile district of Uganda were interviewed. The Burkitt's lymphoma patients ranged in age from 3 to 45 years, all but two being children; there were 20 males and 10 females. Eight of these patients had jaw or facial tumors which had been preceded by infections of the mouth, three patients had had lateral conjunctivitis followed by an orbital and/or maxillary tumor, four patients had had an injury to the tumor site just prior to tumor onset, and six patients had an antecedent history of miscellaneous infections or contact. Among the con-

trols, only one similar history was obtained for the 3 months prior to the interview, although four others had had lesions of the mouth within 6 months to 7 years prior to the interview. Ten of 16 controls had had conjunctivitis during their lifetime. The histories of the Burkitt's lymphoma patients are compatible with *Herpes simplex* infection just prior to tumor onset; it is possible that this or another similar virus acted as a trigger for tumor development.

- 6777 ISOLATION OF COLD-SENSITIVE MUTANTS OF SIMIAN VIRUS 40. (E.) Kimura, G. (Tottori U. Sch. Med., Yonago, Japan). *Jap J Microbiol* 17(6):537-539, 1973.

African green monkey cells were infected with the wild type (WT) strain of Simian virus 40 (SV40), after which the virus particles were extracted and irradiated with UV light. Samples of the irradiated virus were plated at 40 C on African green monkey kidney cell monolayers, frozen and thawed three times, and then tested for their ability to produce plaques at 40 and 33 C. Most of the isolates produced WT plaques at both temperatures, but four isolates produced plaques which were smaller and more turbid or fewer in number at 33 C as opposed to 40 C, or which appeared later at 33 C than did WT plaques at the same temperature. The mutants possessed neutralization antigen(s) similar to that (those) possessed by WT.

- 6778 INTRANUCLEAR CRYSTALS IN FL CELLS INFECTED WITH ECHOVIRUS TYPE 6. (E.) Kawanishi, M. (Fac. Med., Kyoto U., Japan) and Y. Ozaki. *Jap J Microbiol* 17(6):524-526, 1973.

Monolayer cultures of FL cells were infected with echovirus type 6, D'Amori strain, and were incubated for varying amounts of time. Electron microscopy revealed the presence of a large number of intranuclear crystals within the infected cells. These crystals resembled the intranuclear crystals which have been observed in FL cells infected with another picornavirus, poliovirus. Thus, the formation of intranuclear crystals appears to be common in all picornavirus infections. The empty particles composing the intranuclear crystals may have virus-specific antigenicity. The relationship between viral replication and the development of the intranuclear particles is unclear.

- 6779 BRAIN TUMORS INDUCED IN ADULT MONKEYS BY SCHMIDT-RUPPIN STRAIN OF ROUS SARCOMA VIRUS. (E.) Kumanishi, T. (Brain Res. Inst., Niigata U., Japan), F. Ikuta, K. Nishida, K. Ueki and T. Yamamoto. *Gann* 64(6):641-643, 1973.

A suspension of chicken sarcoma cells resulting from inoculation with the Schmidt-Ruppin strain of Rous sarcoma virus (SR-RSV) was injected intracerebrally into adult male *Macaca irus* monkeys. Well-demarcated tumors appeared in half of the monkeys after 20 to 40 days. These tumors were reminiscent of the giant-celled glioblastomas found in man, being composed

predominantly of large bipolar elongated cells and huge round cells, with occasional multipolar cells. No RSV particles were found in the tumors although back transfer to chickens was successful with living brain tumor cells; thus, SR-RSV appeared to present in a masked form in the monkey brain tumors. Three of four tumors reacted positively to antisera to the brain-specific protein S100. No adolase C was found in the monkey brain tumors. The monkey brain tumors were apparently of host, not chicken, origin and they appeared to have been induced by SR-RSV released from the inoculated chicken sarcoma cells.

- 6780 A PAPOVAVIRUS ISOLATED FROM PATIENTS WITH PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY. (E.) Weiner, L. P. (Johns Hopkins U., Sch. Med., Baltimore, Md.) and O. Narayan. *Ann Clin Res* 5(5):279-282, 1973.

Viruses resembling SV40 have been isolated from the brains of two patients with progressive multifocal leukoencephalopathy (PML). The claim that the SV40-like agents were not laboratory contaminants is supported by the rising levels of antibody to SV40 virus in one patient, specific fluorescence of brain sections of the second using SV40 antisera, re-isolation of SV40-like agent from the brain of the second patient utilizing cultures of human fetal brain cells, specific agglutination of virions extracted directly from the brain of the second patient by SV40 antisera in the electron microscopic agglutination test and anti-SV40 antibody made in rabbits utilizing brain homogenates. Studies of nucleic acid of the isolate of the second patient have confirmed the virus as a variant of SV40. Preliminary studies have shown a low degree of cross reactivity between the SV40-PML isolates, the JC-PML agent, the BK virus and SV40.

- 6781 OBSERVATIONS ON THE RESCUE OF SIMIAN VIRUS 40 INDUCED BY CELL FUSION FROM HETEROKARYON CULTURES USING ELECTRON AUTORADIOGRAPHY. (E.) Glaser, R. (Milton S. Hershey Med. Ctr., Pennsylvania State U., Hershey) and R. Farrugia. *Intervirolog* 1(2):135-140, 1973.

Simian virus 40 (SV40)-transformed neonatal hamster cells were fused with susceptible African green monkey kidney cells (CV-1) and the site of synthesis of SV40 in the susceptible cells studied by electron microscopy. Within 24 hr after fusion, virus particles were observed in what was presumed to be the transformed nuclei of the heterokaryons. The mechanism whereby the SV40 genome is induced after cell fusion is unknown.

- 6782 ASSAY OF EPSTEIN-BARR VIRUS BY IMMUNOFLOUORESCENCE. (E.) Sairenji, T. (Kumamoto U. Med. Sch., Japan) and Y. Hinuma. *Gann* 64(6):633-636, 1973.

Stationary floating cultures of the clonal C-6 cell line were infected with Epstein-Barr (EB) virus. The cells were harvested 48 hr later and the formation

of early (E) antigen examined by immunofluorescence. Higher concentrations of target cells resulted in lower percentages of E antigen-forming cells, particularly when low virus doses were used for infection. However, when concentrations of more than 2,000,000 cells/ml were used, varying results were obtained. This assay procedure has given highly reproducible results in repeated experiments.

6783 LYMPHOMAS IN CHILDREN RESEMBLING BUR-KITT'S TUMOUR IN NORTH INDIA—REPORT OF 4 CASES. (E.) Aikat, B. K. (Inst. Med. Education Res., Chandigarh, India), I. C. Pathak and B. N. Datta. *Indian J Cancer* 10(2):128-142, 1973.

See also:

- * (Rev): 6606, 6619, 6620, 6621, 6622, 6623, 6624, 6629, 6635, 6637, 6638, 6643, 6647, 6666
- * (Immun): 6797, 6798, 6800, 6815, 6841

6784 HUMORAL CYTOTOXIC FACTOR IN ISOGRAFT IMMUNITY AGAINST AZO-DYE INDUCED HEPATOMA.

(E.) El-Asfahani, A. M. A. (Fac. Pharmaceutical Sci., U. Tokyo, Japan), H. Maruta, D. Mizuno, M. Ishidate, Jr., Y. Hashimoto and K. Nishioka. *Jap J Exp Med* 43(6):545-548, 1973.

Donryu rats were made resistant against the azo-dye induced hepatoma, AH-64A. Ascites hepatoma AH-414 was derived from a male Japanese Albino rat fed DAB; ascites hepatoma AH-64A from a female Donryu rat fed 3'-Me-DAB. Rabbit anti-AH-414 serum was prepared by injecting washed tumor cells into two rabbits by i.v. and s.c. routes with a total of 3.5×10^8 cells injected per rabbit in 3 wk time. Resistance against AH-414 and AH-64A tumor cells was demonstrated by the i.p. inoculation of tumor cells pretreated *in vitro* by rabbit anti-AH-414 serum. Results of the study indicated that isograft immunity could be demonstrated, together with the isolation of a humoral cytotoxic factor, in the sera of the rat following inoculation of the AH-64A tumor cells. A single i.p. injection of 10^6 pretreated tumor cells was able to protect surviving rats against the reinjection of fresh tumor cells up to 10^6 cell number, indicating a strong immunity. This acquired immunity shows a similarity between the experimental tumor-animal systems of the Donryu rat and the mouse since in both a cytotoxic complement dependent humoral factor was isolated. The fact that serum from the resistant rat is tumor specific and has a strong neutralizing effect suggests that humoral factors are present in the resistant animals.

6785 CELL-MEDIATED ANTITUMOR IMMUNE REACTIONS UNDER SYNGENEIC CONDITIONS. (E.) Leclerc, J. C. (Hosp. St. Louis, Paris, France), A. Senik, E. Gomard, F. Plata and J. P. Levy. *Transplant Proc* 5(4):1431-1434, 1973.

Syngeneic murine sarcoma virus (MSV)-induced tumor extracts were used to inoculate BALB/c and C56BL/6 mice. Tumors developed 6-9 days later at the inoculation site and regressed spontaneously in most cases by day 20. It has been suggested that there are different components in the antitumor immune response. Samples of lymphoid cell suspensions obtained from the mesenteric lymph nodes or the spleens of the mice from day 1 to day 74 after inoculation were studied in mixed lymphocyte-tumor reaction (MLTR), chromium release test (CRT), and microcytotoxicity assay (MA). The results of various tests indicated that responder cells in MLTR are not simultaneously the effector cells in CRT and/or MA. The effector cells in CRT are T cells, in both the allogeneic and syngeneic MSV tumor systems. It appears that non-T cells were involved mainly in MA. B cells might also be involved. The probable involvement of a non T-cell in a tumor cytostatic system was investigated using deprived mice depleted of T cells. The effector cells from these animals were cytostatic for the tumor cells, but the CRT test was negative, indicating that two different cell types could be involved in these two tests. The difference in the nature of the effector cells explains the different effects of the serum

of tumor-bearing animals in CRT and MA. Since the blocking factor in the serum of progressor mice is probably an antigen-antibody complex, it is suggested that the surface immunoglobulins of B cells are important due to their reacting with the antigenic part of the complexes. The *in vivo* role of the cytolytic cells and cytostatic non-T cells is not yet determined.

6786 IMMUNOELECTRON MICROSCOPIC LOCATION OF RECEPTORS WITH TERMINAL N-ACETYL-D-GALACTOSAMINE ON THE SURFACE OF EHRlich ASCITES TUMOR CELLS USING *Helix pomatia* PROTECTIN. (Ger.) Wagner, M. (Ctr. Inst. Microbiol. Exp. Therapy, Jena, Germany) and B. Wagner. *Z Immunitaetsforsch* 146(3):274-282, 1973.

Ehrlich ascites carcinoma was obtained by passage in germfree Agnes Bluhm mice. Pronounced fluorescence was observed in only 5% of the tumor cells stained with *Helix pomatia* conjugated with fluorescein isothiocyanate. Incubation of tumor cells with ferritin-labeled protectin resulted in deposition of the ferritin complex at many sites on the cell surface. Ferritin was found only on the cell membrane, primarily on cellular processes, but in a few cells ferritin was also present in vacuoles located immediately below the cell surface. Similar results were obtained with peroxidase-labeled protectin. In addition, strong nonspecific contrasting of cristae was observed in the mitochondria. This was caused by reaction of endogenous cytochrome oxidase with the peroxidase substrate. N-acetyl-D-galactosamine inhibited all three of these reactions, while N-acetyl-D-glucosamine did not. These findings indicate that the surface receptors in Ehrlich ascites carcinoma cells contain a compound similar to α -N-acetyl-D-glucosamine, but this compound is not necessarily identical to it. The distribution of these receptors is much more limited than those previously detected with wheat germ agglutinin and concanavalin A. It remains to be determined whether other receptors would be liberated for protectin by treatment with proteases and other enzymes.

6787 IMPAIRED RECIRCULATION OF B LYMPHOCYTES IN CHRONIC LYMPHOCYTIC LEUKEMIA. (E.)

Flad, H.-D. (Dept. Clinical Physiol., U. Ulm, Germany), C. Huber, K. Bremer, H.-D. Menne and H. Huber. *Eur J Immunol* 3(11):688-693, 1973.

Lymphocytes of the peripheral blood and thoracic duct lymph were studied in four patients with chronic lymphocytic leukemia (CLL), one patient with lymphosarcoma (LSA) and three patients with nonhematological diseases (controls). When stimulated *in vitro* with phytohemagglutinin (PHA), lymph lymphocytes of CLL patients responded markedly as determined by 14 C-thymidine incorporation, whereas blood lymphocytes showed a delayed and diminished response. The response of blood and lymph lymphocytes of the LSA and control patients was equal. Purified rabbit antisera against κ , λ , μ and γ -chains were labeled with 125 I and the labeled cells assessed by autoradiography. In CLL patients, the percentage of lym-

phocytes bearing κ and μ determinants was higher in the blood than in the lymph. Controls showed a much lower percentage of lymphocytes with immunoglobulins, which was equal in blood and lymph. Furthermore, the membrane dynamics of HL-A-anti-HL-A complexes on the surface of blood and lymph lymphocytes were studied by means of membrane fluorescence. In CLL, the percentage of lymph lymphocytes showing "cap formation" within 2 hr was higher in the lymph than in the blood. Using autotransfusion of [^3H]cytidine-labeled blood lymphocytes, it is shown that the recovery of labeled cells in the lymph of CLL patients within 48 hr is diminished compared to controls. It is concluded that in CLL, the leukemic cells are B cells whose capacity to recirculate from blood to lymph through the postcapillary venules is impaired. Only a minor population of PHA-responsive T cells appears to recirculate normally. Consequently, the concentration of T cells is higher in the lymph than in the blood and the leukemic B lymphocytes accumulate in the vascular pool. The impaired ability for recirculation and "cap formation" suggests a membrane abnormality of the CLL cell.

- 6788 ANTIBODIES TO DNA IN PATIENTS WITH MALIGNANT NEOPLASMS IN VARIOUS SITES. (Rus.) Stefani, N. V. (Sci. Res. Inst. Med. Radiol., USSR), N. T. Saenko and A. M. Poverennyi. *Vopr Onkol* 19(12):34-36, 1973.

The passive hemagglutination test was used to detect antibodies to DNA in sera from 128 patients with Hodgkin's disease, 17 with reticulosarcomatosis, 6 with reticulosis, 50 with reticulum cell sarcoma of the bone, and 100 with cancer of the stomach, intestine, or uterus. Controls consisted of 112 blood donors. DNA was isolated from the thymus, and denatured and formalin-treated DNA were employed. Sera which showed a positive reaction were checked with the antibody neutralization test. Antibodies to DNA occurred more often in patients with reticulosis (100%), reticulum cell sarcoma of the bone (88%), and cancer (75%) than in the control group (56%). Antibody titers of 1:80 or higher were encountered more frequently in patients with reticulosis (66%) than in those with Hodgkin's disease (19%) or in the controls (36%). These differences are statistically significant. Local irradiation had no effect on the incidence of antibodies to DNA.

- 6789 INDIVIDUAL ANTIGENIC SPECIFICITY OF MURINE MYELOMA PROTEINS. (Fr.) Kolb, J.-P. (Sci. Res. Inst. Cancer, Villejuif, France) and G. Lespinats. *Eur J Immunol* 3(11):707-710, 1973.

The antigenic specificity of five myeloma proteins was studied in BALB/c mice with plasmacytomas induced by Bayol F and maintained by serial passage. These proteins were IgG2 (K_{10}), IgG1 (A_2) and three IgA fractions (A_1 , LA_3 and A_8). After absorption on serum from normal mice which had been polymerized with glutaraldehyde, antisera obtained by injecting rabbits with myeloma protein fractions and complete Freund adjuvant reacted only with their homologous paraprotein in the precipitation reaction, double

diffusion in agar, and immunoelectrophoresis. These antisera did not react with normal mouse serum or normal mouse immunoglobulins. An attempt was made to determine whether a normal immunoglobulin population of syngeneic mice could exhibit the counterpart of these individual antigenic specificities by using passive hemagglutination of sheep RBC coated with protein by monospecific homologous antiserum and hemagglutination inhibition with normal immunoglobulins. Although the specific counterparts of IgG1 and IgG2 were found, no such counterpart was detected for the three IgA myeloma proteins, even though a reaction of antigenic identity was found between two IgA proteins. The finding of counterparts for the two IgG myeloma protein fractions suggests that these immunoglobulins are normal molecules or that individual specificity could only be due to small identical fragments which are present both in normal and myeloma proteins.

- 6790 FLUORESCENT ANTIBODY STUDIES IN MALIGNANT MELANOMA. (E.) Whitehead, R. H. (Queensland Inst. Med. Res., Herston, Australia). *Br J Cancer* 28(6):525-529, 1973.

Sera from 57 patients with malignant melanoma and 39 control patients were tested by immunofluorescence techniques against 6 melanoma cell lines. Thirty-two percent of the sera from the melanoma patients showed fluorescence with these cell lines, whereas only 17% of the control sera were positive. Reactions occurred in 21% of the tests using the sera from patients with primary melanoma, compared with 40% using the secondary melanoma sera and 54% using the "cured" melanoma sera. The cell lines varied in antigenicity but this did not correlate with either pigmentation or length of time in culture. The cell lines which were most reactive with the sera from the melanoma patients were also most reactive with the control sera.

- 6791 RAT ALPHA-FETOPROTEIN: ISOLATION, CHARACTERIZATION AND ESTROGEN-BINDING PROPERTIES. (E.) Aussel, C. (Inst. Sci. Res. Cancer, Villejuif, France), J. Uriel and C. Mercier-Bodard. *Biochimie* 55(11-12):1431-1437, 1973.

Rat α -fetoprotein (α -FP) was isolated from amniotic fluid by an immunochemical procedure using high capacity immunoabsorbents. The yield was about 75% of the initial content in α -FP. The isolated α -FP was found pure by electrophoretic and immunochemical criteria. A molecular wt of 72,000 daltons and a sedimentation coefficient of 4.5 S were estimated by SDS-acrylamide-agarose electrophoresis and sucrose gradient centrifugation, resp. The latter procedure was also used to study the binding activity of α -FP toward several steroids. All the estrogens tested, estrone, estradiol, estriol and diethylstilbestrol, were bound. By equilibrium dialysis, the intrinsic association constant of pure α -FP was $1 \times 10^8 \text{ M}^{-1}$ for estrone and $6 \times 10^7 \text{ M}^{-1}$ for estradiol. One molecule of estrone and estradiol was bound/molecule of protein. No significant binding was observed with testosterone and progesterone. The

specificity of the estrophilic activity of α -FP appears a characteristic of this protein. After electrophoresis of pure α -FP in acrylamide-agarose gels of low porosity (11% of acrylamide monomer), two closely migrating but distinct bands could be demonstrated. Both forms possess estrogen-binding activity and common antigenic properties. The same molecular heterogeneity of α -FP was observed in whole amniotic fluid. A comparison of several physicochemical parameters of human α -FP with α -FP from serum and amniotic fluid revealed remarkable similarities. In addition to electrophoretic microheterogeneity, both fetoproteins have an electrophoretic mobility slightly slower than serum albumin and closed values of sedimentation coefficient and molecular wt. Human α -FP also specifically binds estrogens, although with lower affinity than rat α -FP. Some crossed antigenicity has been demonstrated between rat and human α -FP. It is suggested that other physicochemical or chemical relations exist among α -fetoproteins from different origin.

- 6792 DISTRIBUTION OF ^{51}Cr -LABELED LYMPHOID CELLS IN THE LYMPH NODE DRAINING THE INOCULATED TUMOR IN THE RAT. (E.) Ogura, T. (Osaka U. Hosp., Japan) and Y. Yamamura. *Gann* 64(5):433-439, 1973.

Experimental lymph node metastases were induced in the ipsilateral lumbar node following the inoculation of ascites hepatoma cells into the muscle of the hind legs of Donryu rats. At various time intervals after inoculation, the distribution of ^{51}Cr -labeled lymphoid cells which had been prepared from the lymph nodes of normal rats and injected i.v. one day beforehand was studied. The distribution of ^{51}Cr -labeled lymphoid cells increased transiently in the lumbar node draining the inoculated tumor. It was kept at a certain level in the node involved slightly with metastasized tumor cells even when the interval after inoculation was increased but it decreased very markedly in the nodes which were damaged extensively. In addition, the degree of sinus histiocytosis in the node seemed to be related significantly to the distribution of ^{51}Cr -labeled lymphoid cells.

- 6793 INCREASE IN MEMBRANE ANTIGEN EXPRESSION OF HUMAN LEUCOCYTES TRACED BY ALG AS A FUNCTION OF TIME IN CULTURE. (E.) Rosenfeld, C. (Hosp. Paul Brousse, Villejuif, France), J. F. Dore, C. Choquet, A. M. Venuat, L. Marholev, J. P. Wastiaux, C. Guibout and J. L. Pico. *Biomedicine* 19(12):541-543, 1973.

Cultures were started from two donors with acute myeloid leukemia, one with chronic myeloid leukemia and one with acute lymphoid leukemia. In all cultures an increase in F-anti-human lymphocytic globulin binding by cultured cells for two different dilutions of the same conjugate was noted. This increase in antigenicity was not dependent on the establishment of a permanent cell line. The quantity of viable and dead cells in the culture did not appear to affect the increase in antigenic expression which was also independent of the thymidine uptake by

cultured cells, and was demonstrated in cultures derived from normal as well as leukemic human leukocytes. These results indicate that cells originating from a leukemic and from a normal donor exhibit identical affinity for anti-human lymphocytic globulin. Therefore, cells of human lymphoblastoid lines can be used as a quantitative antigen source for raising anti-human lymphocyte globulin in animals regardless of their normal or leukemic origin. The increase in F-anti-human lymphocytic globulin binding index after cultivation is initially independent of DNA synthesis and of cell division, accounting for the progressive modification of cell membranes as an adaptation to a new environment. Following a variable lag phase, the DNA synthesis increases rapidly. The lag phase may be an adaptation period where cell membranes undergo modifications, as indicated by an increase in affinity for ruthenium red of the cell coat of these cells, by an increase in cell membrane permeability, and by production of and/or susceptibility to stimulating factors produced by these cells. F-anti-human lymphocytic globulin binding index rises to a maximum when the cells are established, showing that these cell lines could represent a better quantitative antigen source than fresh cells for anti-human lymphocytic globulin production.

- 6794 REACTIVITY OF LYMPHOCYTES FROM NORMAL PERSONS ON CULTURED TUMOR CELLS. (E.) Takasugi, M. (Sch. Med. U. California, Los Angeles), M. R. Mickey and P. I. Terasaki. *Cancer Res* 33(11):2898-2902, 1973.

Cultured tumor cells from 7 established lines and 12 short-term cultures were reacted with lymphocytes from patients with the same "histological type" of cancer as the target cells in 995 tests and with lymphocytes from normal controls in 1099 tests. The average reactivity was significantly greater with lymphocytes from normal persons in 3 of the 7 established lines and 2 of 12 short-term cultures. In only one short-term bladder tumor culture was there indication of greater cytotoxicity produced by lymphocytes from bladder cancer patients than by cells from normal persons. Thus, the cell-mediated target cell reduction of cultured human tumor cells is not confined to patients with cancer.

- 6795 ISOLATION AND CHARACTERIZATION OF PLASMA MEMBRANES FROM HUMAN LEUKEMIC LYMPHOCYTES. (E.) Marique, D. (Jules Bordet Inst., Brussels, Belgium) and J. Hildebrand. *Cancer Res* 33(11):2761-2767, 1973.

A method for the isolation of lymphocyte plasma membranes from patients with chronic lymphocytic leukemia is described. Lymphocytes were disrupted in a hypotonic bicarbonate medium using a Dounce homogenizer. The plasma membranes fraction was finally collected from a continuous sucrose gradient at density 1.115 (g/ml). Electron micrographs of this material showed membranes and small dense vesicles of unidentified origin. The enrichment of this fraction in adenosine 5'-monophosphatase, Mg^{2+} :

$\text{Na}^+:\text{K}^+$:adenosine triphosphatase, and uridine diphosphatase, considered as plasma membrane markers, was, resp., 43-, 23-, and 42-fold. The only noticeable contamination of plasma membranes was lysosomal material as attested by a 4.7-fold increase in β -glucuronidase specific activity. It was calculated, however, that lysosomes accounted for less than 10% of the plasma membrane fraction. The concentration of cholesterol and total phospholipids per mg of plasma membrane protein was, resp., 185 and 965 μg , thus 10- and 6-fold higher than in the whole homogenate. The molar ratio of cholesterol to phospholipids was 0.38.

- 6796 IMMUNOHISTOLOGICAL LOCALIZATION OF CARCINO-EMBRYONIC ANTIGEN AND NONSPECIFIC CROSS-REACTING ANTIGEN IN GASTROINTESTINAL NORMAL AND TUMORAL TISSUES. (E.) Burtin, P. (Inst. Scientific Cancer Res., Villejuif, France), S. von Kleist, M. C. Sabine and M. King. *Cancer Res* 33(12):3299-3305, 1973.

The localization of the carcinoembryonic antigen (CEA) of gastrointestinal tumors and of the nonspecific cross-reacting antigen (NCA) was studied by immunocytological techniques in various cancerous and noncancerous human digestive tissues. NCA had the same centroglandular localization as CEA in cancerous and noncancerous glands of colonic and gastric mucosae. The only difference was that NCA was detected much more often on adjacent cellular membranes. Various patterns were observed in gastric adenocarcinomas, the most striking being the intracytoplasmic localization of CEA and NCA in signet ring cells of linitis plastica and the absence of labeling of anaplastic areas. In noncancerous gastric mucosae, which were either peritumoral or excised for a gastric or duodenal ulcer, CEA and NCA were found only in glands having undergone an intestinal metaplasia. The results indicate that the same pattern of differentiation is required for the synthesis of NCA and CEA.

- 6797 ELECTRON MICROSCOPE STUDY OF ANTIGENS IN CELLS OF MOUSE MAMMARY TUMOR CELL LINES BY PEROXIDASE-LABELED ANTIBODIES IN SERA OF MAMMARY TUMOR-BEARING MICE AND OF PATIENTS WITH BREAST CANCER. (E.) Hoshino, M. (Dept. Virol., U. Texas, Houston) and L. Dmochowski. *Cancer Res* 33(11):2551-2561, 1973.

Sera from C3H/Z/Dm mice bearing spontaneous mammary tumors, sera from apparently normal C3H/Z/Dm mice at different ages, and serum from an A/Dm mouse with spontaneous breast cancer were tested by the indirect immunoperoxidase method against cells of the C3H/HeJ spontaneous mammary tumor line constantly producing type B or mouse mammary tumor virus particles. The sera were also tested against cells of the C3H/He/TEX spontaneous mammary tumor line producing no virus particles. The sera from the C3H/Z/Dm and A/Dm tumor-bearing mice and the serum from the apparently normal C3H/Z/Dm mouse gave peroxidase labeling of immature and mature type B or mouse mammary tumor virus particles and also of budding type B particles.

No peroxidase labeling of intracytoplasmic type A virus particles was observed. In addition, peroxidase labeling of certain parts (presumably, antigen formation sites) of the plasma membrane of the C3H/HeJ mammary tumor cells was seen. Absorption of the positive mouse sera with guinea pig kidney cells, C3H/Z/Dm mouse embryo cells, C3H/Z/Dm spontaneous mammary tumor cells, or with mammary tumor virus from milk of C3H/Z/Dm mice demonstrated that the immunoperoxidase reaction was due to specific anti-virus antibodies. Positive sera failed to react with cells of the C3H/He/TEX mammary tumor line producing no virus particles. A number of sera from patients with breast cancer and from their relatives were also tested by immunoperoxidase reaction against cells of the C3H/HeJ spontaneous mouse mammary tumor line. As in the case of the positive mouse sera, some human sera gave peroxidase labeling of type B and budding virus particles. Absorption with suitable material (guinea pig kidney, sheep red blood cells, whole human embryo cells, breast tumor tissue homogenates, and a mouse mammary tumor virus preparation) demonstrated that the antibodies in the human sera were specifically directed against the mouse mammary tumor virus particles.

- 6798 LYMPHOCYTE SURFACE MARKERS IN LYMPHOPROLIFERATIVE DISORDERS. (E.) Aiuti, F. (Dept. Clinical Med., U. Rome, Italy), V. Lacava, M. Fiorilli and M. V. Ciarla. *Acta Haematol (Basel)* 50:275-283, 1973.

Peripheral blood lymphocytes of 18 normal controls and 32 patients with lymphoproliferative disorders were examined for the presence of surface markers. T cell frequency was decreased in chronic lymphocytic leukemia (CLL), Hodgkin's disease, and myeloma, and was normal or decreased in acute lymphocytic leukemia (ALL). Lymphocytes with surface membrane receptors specific for all Ig were markedly increased in lymphosarcoma and cryomacroglobulinemia, extremely decreased in ALL, and normal in Hodgkin's disease; only lymphocytes specific for IgM were increased in CLL. Receptors for C3 were diminished or absent in CLL and ALL. In the remission phase of ALL, EAC and E rosettes returned to normal and sIg were almost normal. These diseases may be classified in relation to the T and B cell frequency to aid in diagnostic and therapeutic activities.

- 6799 CHARACTERIZATION AND PARTIAL PURIFICATION OF NORMAL AND TUMOR ASSOCIATED TRANSPLANTATION ANTIGENS OF RAUSCHER LEUKEMIA CELLS. (E.) Martyre, M.-C. (Paul-Brousse Hosp., Villejuif, France), O. Halle-Pannenko and P. Jolles. *Eur J Cancer* 9(10):757-761, 1973.

Partially purified hydrosoluble extracts were obtained from the membranes of RC19 tumor cells carried in ascites form in Balb/c mice via isoelectrofocusing. The biological activity of these extracts was assayed *in vitro* according to the capacity of the partially purified antigen to absorb cytotoxic activity from allogeneic antisera specific for the Friend-Moloney-Rauscher tumor associated antigen

(TAA) as well as for antisera specific for normal H-2 transplantation antigens. The partially purified material contained both TAA and normal H-2 antigen. No separation of normal and tumor antigens was observed. Separation on acrylamide gel revealed two protein bands, the identities of which are presently unknown.

- 6800 ANTIGENIC AND BIOCHEMICAL CHARACTERIZATION OF THE C-TYPE PARTICLE OF THE STABLE PORCINE KIDNEY CELL LINE PK-15. (E.) Woods, W. A. (Nat'l. Cancer Inst., Bethesda, Md.), T. S. Papas, H. Hirumi and M. A. Chirigos. *J Virol* 12(5):1184-1186, 1973.

The C-type particles in the porcine kidney cell line PK-15 were observed by electron microscopy and demonstrated to have biochemical and biophysical properties associated with the oncornavirus group: density of 1.16 in a sucrose gradient, 70S RNA, and the RNA-dependent DNA polymerase. The group-specific interspecies antigen, gs-3, was not present. Evidence of a latent infection with a porcine parvovirus was also obtained.

- 6801 THE BLOOD GROUP A-LIKE SITE ON THE CARCINO-EMBRYONIC ANTIGEN. (E.) Gold, J. M. (McGill U. Med. Clinic, Montreal, Canada) and P. Gold. *Cancer Res* 33(11):2821-2824, 1973.

The quantitative binding of specific serum immunoglobulin moieties to carcinoembryonic antigen (CEA)-¹²⁵I was studied using a quantitative radioimmunoassay technique. It was found that the majority of human sera containing anti-blood group A (anti-A) antibodies are able to bind to CEA-¹²⁵I, and that this binding is due primarily to immunoglobulin M moieties in the sera. Inhibition studies revealed that immunoglobulin M anti-A antibodies are capable of binding to a site or sites on purified CEA. These results confirm those obtained using radioimmuno-electrophoresis. The data indicate that the CEA molecule has a blood group A-like site which can be recognized by anti-A antibodies.

- 6802 INDUCTION OF IMMUNITY TO A MOUSE LYMPHOMA BY MULTIPLE METHODS, INCLUDING VACCINATION WITH SOLUBLE MEMBRANE FRACTIONS. (E.) Prager, M. D. (U. Texas Southwestern Med. Sch., Dallas), A. C. Hollinshead, R. J. Ribble and I. Derr. *J Nat'l Cancer Inst* 51(5):1603-1607, 1973.

C3H mice were rendered immune to the growth of 6C3HED lymphomas by: L-asparaginase treatment of tumor-bearing animals; vaccination with iodoacetamide-modified 6C3HED cells; transfer of spleen and lymph node cells from immune mice (100% protection at a lymphoid cell:tumor cell ratio of 100:1); preincubation of tumor cells with noncytotoxic immune serum prior to injection into nonimmune hosts; or vaccination with soluble 6C3HED membrane antigen(s). Two membrane fractions isolated from Sephadex G-200 columns contained antigens that were

effective in protective vaccination and in neutralizing antibody in the highly specific C3H anti-6C3HED. C3H anti-6C3HED had more restricted specificity for the tumor cells than did AKR anti-6C3HED. The former failed to sensitize normal C3H peritoneal cells and reacted with a smaller fraction of cells from tumor-bearing mice than the AKR serum, indicating that the latter contained antibodies to tissue antigens not present in the C3H antiserum.

- 6803 STUDIES OF HUMORAL AND CELL-MEDIATED IMMUNITY IN HUMAN MELANOMA. (E.) Mukherji, B. (Dept. Med., New England Med. Ctr. Hosp., Boston, Mass.), L. Nathanson and D. A. Clark. *Yale J Biol Med* 46(5):681-692, 1973.

Various studies have demonstrated the existence of a tumor associated soluble antigen capable of stimulating both autochthonous and allogeneic lymphocytes from melanoma patients; a cross-reacting tumor associated antigen has also been found. Antigens with tumor related specificity are often shared by melanomas of different patients, although individual specificity of cell surface antigen in melanoma also exists. There is some evidence that the incidence and level of antimelanoma antibody correlated with the stage of the disease. Cell mediated immunity rather than humoral immunity appears to be the principal effector mechanism in the immune defense against cancer. Cell mediated immunity against tumors seems to involve a delayed hypersensitivity reaction, for which immune lymphocytes are the responsible mediator cells. Many studies have shown that autologous and sometimes allogeneic lymphocytes react with melanoma cells or melanoma cell products. Lymphocytes have also been shown to undergo transformation when they interact with melanoma cells. Further, *in vitro* lymphocyte mediated cytotoxicity may decrease with the metastatic spread of melanoma, and patients with progressive metastatic disease exhibit a circulating factor in their sera which is capable of blocking autologous and allogeneic lymphocytotoxicity *in vitro*. There is a clear need for standardization of the microtest technique for the assay of lymphocyte cytotoxicity. A new system of heterotransplantation involving the transplantation of a human melanoma into Wistar Furth rats, appears to augment cell membrane antigenicity and may serve as a tool for further immunologic study. The observation that the HL-A5 sublocus is deleted in melanoma patients may provide a genetic marker in this tumor system.

- 6804 AN ULTRASTRUCTURAL STUDY OF THE LOCALIZATION OF THE CARCINOEMBRYONIC ANTIGEN IN ADENOCARCINOMAS OF THE HUMAN COLON. (E.) Huitric, E. (Regional Ctr. Cancer Control, Cedex, France). *Ann Immunol (Inst Pasteur)* 124 C(4):603-608, 1973.

The ultrastructural position of the carcinoembryonic antigen (CEA) in adenocarcinomas of the human colon was studied by light and electron microscopy. The light studies revealed CEA activity on the luminal surfaces of the tumoral cells lining the neoplastic glands. Electron microscopic examination of these areas indicated that the CEA was localized in the

outer leaflet of the apical membranes of the tumoral cells or, more precisely, in the glycoprotein coating of these cells. This association between CEA and the cell coat might account for the variations observed in the intensity of the CEA reaction in different tumorous glands. Neither the light nor the electron microscopic studies revealed any intracellular CEA.

- 6805 A PROPOSAL TO PREPARE A BIOLOGICAL STANDARD FOR CARCINOEMBRYONIC ANTIGEN. (E.) Anderson, S. G. (Natl. Inst. Biol. Standards Control, London, England), D. J. R. Laurence and A. M. Neville. *Ann Immunol (Inst Pasteur)* 124C(4):641-642, 1973.

Provided that a satisfactory method can be developed for freeze drying carcinoembryonic antigen (CEA), it is proposed that 4000 identical ampules of a proposed biological standard be produced. Samples of this standard would be identical among themselves and the standard would be both stable and pure; the proposed standard should thus be examined by all common methods of testing available. An international standard should be stored at low temperatures and issued for use by a national or international body. Further, if certain steps in the various assay methods were found to affect the relative potency of the substances being tested, these steps should be specified. While considerable technical difficulties might be encountered in preparing such a biological standard, these difficulties could probably be overcome.

- 6806 IMMUNOLOGICAL DEFICIENCY IN MYELOFIBROSIS. (E.) Selroos, O. (Helsinki U. Central Hosp., Finland), B. Skrifvars and C. Wasastjerna. *Scand J Haematol* 11(4):307-313, 1973.

The lymphocyte functions were studied in 12 patients (9 females) with myelofibrosis. In all cases, the total serum protein concentrations were normal and in all but two cases the filter paper electrophoretic fractions were almost within normal limits; two patients showed obvious hypogammaglobulinemia, with low IgG, IgM, and IgA concentrations. Four other patients had low IgA values, one of whom also had a low IgG value. The patients with hypogammaglobulinemia and two other patients in the series displayed signs of depressed delayed-type hypersensitivity. The immunodeficiency observed was probably secondary to the bone marrow damage, although a disturbed immune response may contribute to the development of bone marrow fibrosis and myeloid metaplasia.

- 6807 STUDIES ON CARCINOEMBRYONIC ANTIGEN (CEA) AND A RELATED GLYCOPROTEIN, CCEA-2. PREPARATION AND CHEMICAL CHARACTERIZATION. (E.) Turberville, C. (Royal Cancer Hosp., London, England), D. A. Darcy, D. J. R. Laurence, E. W. Johns and A. M. Neville. *Immunochemistry* 10(12):841-843, 1973.

Carcinoembryonic antigen (CEA) and related CCEA-2 have been extracted from human metastatic colonic

carcinomas and separated by gel filtration. The amino acid compositions of CEA samples prepared from different colonic carcinomas are very similar, but differ from that of partially purified CCEA-2. CCEA-2 is a glycoprotein like CEA and shows partial immunological identity with it. However, both CEA and CCEA-2 have antigenic determinants which are not common to both. Also, CCEA-2 is a smaller molecule than CEA, as it elutes later from gel filtration columns, and it differs from CEA in its amino acid composition and has a higher protein content. CEA shows charge heterogeneity which is not due to variation in its overall amino acid composition and which may therefore be due to variation in sialic acid content of CEA molecules. CEA purified by gel filtration is free from CCEA-2.

- 6808 THE PRODUCTION OF CARCINOEMBRYONIC ANTIGEN (CEA) BY HUMAN COLONIC CARCINOMAS AND NORMAL COLONIC MUCOSA IN MONOLAYER AND ORGAN CULTURE. (E.) Breborowicz, J. (Inst. Cancer Res., London, England), G. C. Easty and A. M. Neville. *Ann Immunol (Inst Pasteur)* 124C(4):613-614, 1973.

Carcinoembryonic antigen (CEA) was estimated by a double antibody radioimmunoassay method in monolayer cultures of human colonic carcinomas. CEA (1 to 100 ng/ml/day) was found in all 12 of the monolayer cultures obtained. The CEA concentration correlated well with the growth of epithelial colonies in the cultures and with the degree of histological differentiation of the tumors. In six cases, where only fibroblasts were grown, no CEA was detected in the culture media. CEA (up to 1000 ng/ml/day) was also found in the culture media or of organ cultures of colonic carcinomas, and in small amounts (100-500 ng/ml/day) in organ cultures of normal mucosa. No CEA was detected in the culture medium of a single organ culture of serosal cells. The CEA produced in the monolayer and organ cultures closely resembled or was identical to samples of authentic CEA.

- 6809 SERUM CEA IN NORMAL INDIVIDUALS AND IN CLINICAL DISORDERS. (E.) Booth, S. N. (Dept. Exp. Path., U. Birmingham, Great Britain), J. King, J. Leonard and P. W. Dykes. *Ann Immunol (Inst Pasteur)* 124C(4):631-632, 1973.

Serum carcinoembryonic antigen (CEA) levels were determined in 255 normal individuals and 520 individuals with a variety of clinical disorders. The results from the normal population were consistent with a Gaussian distribution except for six cases in which the CEA levels were considerably higher than would be expected. Two of these six subjects smoked 15 cigarettes per day, while another showed minimal evidence of alcohol induced liver disorder. The CEA levels were also elevated in 71% of the patients with carcinomas of the gastrointestinal tract, 42% of the patients with other types of malignancy, 14% of the patients with benign diseases of the gastrointestinal tract, and 66% of the patients with benign liver disorders. The CEA levels were generally higher in cancer patients in whom metastatic spread had occurred and the levels generally fell following

complete surgical removal of the tumors. The CEA levels remained elevated in 12 surgically treated cancer patients, 10 of whom showed evidence of tumor recurrence. In only one surgically treated patient with normal CEA levels was there a recurrent tumor.

6810 ANTIGEN-STIMULATED DNA SYNTHESIS IN THE BURSA OF FABRICIUS OF THE CHICKEN. (E.)

Bäck, R. (Dept. Histol., U. Uppsala, Sweden). *Acta Pathol Microbiol Scand* [A] 81(3):337-343, 1973.

The influence of antigenic stimulation on cell proliferation in different lymphoid organs of the chicken was investigated by studying ^3H -thymidine incorporation into DNA. Six-week-old chickens were either immunized with human serum albumin (HSA) or given sterile physiological saline 24 or 72 hours before sacrifice. Thirty minutes before sacrifice, the chickens were intravenously injected with ^3H -thymidine. At 24 hours after the immunization the incorporation of label (cpm/ μg DNA) into the bursa of Fabricius was significantly higher in the immunized chickens than in the saline injected controls. At 72 hours after immunization, the mean incorporation of label into the bursa was of the same magnitude in the immunized and the control chickens. These findings suggest that the bursa of Fabricius, although a central lymphoid organ, may react with increased cell proliferation early after antigenic stimulation. The incorporation of label into the thymus was not at any time influenced by the immunization.

6811 CARCINOEMBRYONIC (CEA) AND CEA-LIKE ANTIGENS IN FAECES. (E.)

Hirsch-Marie, H. (Immunochem. Res. Lab., Paris, France), G. Chavanel and P. Burtin. *Ann Immunol (Inst Pasteur)* 124C(4):609, 1973.

Perchlorosoluble (PCA) fecal extracts from healthy humans, pregnant women, and patients with digestive cancers and various other diseases were analyzed, along with meconium samples, for the presence of CEA or CEA-like antigens. Of 30 cases of digestive cancer, CEA was found in 8 fecal extracts, nonspecific cross reacting antigen (NCA) was found in 29 extracts, and NCA 2 was found in 23 extracts. CEA was identified in the extracts of 5 of the 26 control subjects and occurred in 3/4 of the fecal samples from the pregnant women. CEA was also present in the meconium of a 5.5 month old fetus, while NCA was present in 4 of 5 meconium samples and NCA 2 was present in all 5. NCA and NCA 2 appear to be normal fecal extract constituents, and double diffusion studies on PCA extracts do not appear to distinguish the feces of digestive cancer patients from those of noncancerous subjects or subjects with other forms of cancer.

6812 CELLULAR IMMUNITY IN HUMAN OSTEOGENIC SARCOMA. (E.)

Gangal, S. G. (Cancer Res. Inst., Tata Mem. Ctr., Bombay, India), S. S. Agashe, P. N. M. Nair and R. S. Rao. *Indian J Cancer* 10(3):295-301, 1973.

Lymphocytes from 10 healthy individuals, 10 carcinoma patients, 11 patients with nonmalignant

bone disorders, and 12 osteosarcoma patients were added to monolayer cultures of AC 13590 and AC 13415 cells derived from the osteogenic sarcomas of two patients. The lymphocytes from a high percentage of the osteosarcoma patients showed significant lymphocytotoxicity against the osteogenic sarcoma cells. Compared with the reactivity of the lymphocytes obtained from the healthy donors, the lymphocytes from the carcinoma patients and the patients with nonmalignant bone disorders showed significant reactivity. Thus the sensitization of the lymphocytes from the osteosarcoma patients was tumor specific. The fact that the lymphocytes from the healthy subjects brought about a certain percentage of reduction in the target cell number of the two osteosarcoma cell lines indicates that histocompatibility differences may have existed between the lymphocyte donor and target cell donor.

6813 INTERACTION OF HUMAN MELANOMA CELL LINES WITH AUTOCHTHONOUS LYMPHOID CELLS. (E.)

Mitchen, J. R. (Dept. Surg., Denver Gen. Hosp., Colo.), G. E. Moore, R. E. Gerner and L. K. Woods. *Yale J Biol Med* 46(5):669-680, 1973.

Thirty melanoma cell lines were established from the biopsies, effusions, and blood of 18 patients, and 116 lymphoid cell lines were established from 50 malignant melanoma patients. The malignant melanoma cell lines were comprised of comparatively large cells containing melanosomes; melanin production appeared to be inversely related to the growth rate of the melanoma cells. Unlike the lymphoid cell lines, most of the melanoma cell lines had abnormal chromosome constitutions. The lymphoid cell lines were comprised of primitive cells which continually produced immunoglobulins. Antibodies to tumor antigens were detected in several autologous sera which reacted specifically with the membranes of cultured cells. When autochthonous cells from one lymphoid cell line were added to tumor cell culture, the tumor cells began to die within 30 hr. Inactive lymphoid cells could be activated by prior interaction with live melanoma cells and heat-inactivated sera appeared to block the active culture or fresh autochthonous lymphoid cells from killing the melanoma cells. The interactions of the lymphoid cell-melanoma cell mixtures were evaluated by a new semimicro plate assay, by time-lapse, phase-contrast cinemicroscopy, and by electron microscopy.

6814 SEARCH FOR TUMOR SPECIFIC REACTIVITY IN HUMAN LEUKEMIAS. (E.)

Nadkarni, J. S. (Cancer Res. Inst., Tata Mem. Ctr., Bombay, India), J. J. Nadkarni and M. P. Gollerkeri. *Indian J Cancer* 10(3):338-345, 1973.

Membrane immunofluorescence was used to test for the presence of membrane bound antigen(s) on leukemia cells derived from the heparinized blood of 54 leukemic humans. Cells from 25 of the 38 cases of chronic myeloid leukemia (CML) and 3 of the 10 cases of acute lymphatic leukemia showed positive autochthonous serum/cell reactivity demonstrated positive reactivity with autologous sera.

Similarly, cross-reactivity tests using allogeneic leukemic sera against CML and all cells showed that 56% of the CML sera and 35% of the ALL sera cross-reacted with CML cells, while 40% of ALL and 27% of CML sera cross-reacted with ALL cells. Tissue culture lines derived from leukemic buffy coat cells showed almost identical, or possibly higher, reactivity against autologous and allogeneic leukemic sera. The reactivity of autochthonous serum/cell combinations may be relevant to the response of the patient to chemotherapy. A possible correlation between autologous serum/cell reactivity and the response of the patient is indicated.

- 6815 USE OF AN IMMUNOFLUORESCENCE METHOD FOR DETECTION OF A SPECIFIC MEMBRANE ANTIGEN INDUCED IN VARIOUS CLASSES OF ANIMALS BY ROUS VIRUS. (Rus.) Babkova, O. V. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR) and I. N. Kriukova. *Vopr Virusol* (2):147-151, 1973.

Mouse embryo cells, infected with Rous sarcoma virus and examined by indirect immunofluorescence before the onset of transformation, did not contain membrane-specific antigen (MSA). No MSA was detected in a stable mouse line (No. 36) transformed *in vitro* by a highly oncogenic variant of Rous virus, but MSA was found in a large percentage of tumors induced in mice by injection of this line of mouse cells. MSA was also detected on the surface of Rous sarcoma in chickens and, in a much smaller percentage of cells, in normal chick cells obtained shortly before hatching and after these chick cells had been incubated *in vitro*. The percentage of fluorescing cells in mouse and chicken sarcomas was almost the same and was independent of the strain of Rous virus and the line of mice in which tumors were induced. Preliminary absorption of mouse immune sera on 20-day-old chick embryo cells or on these cells after they had been cultivated for 3-4 days *in vitro* completely eliminated their activity in mouse tumor cells. The activity of the serum was not decreased by absorbing it on normal chick cells taken directly from 7-10-day-old embryos. Immune mouse sera did not react in the complement-fixation test with antigen from Rous chicken sarcomas, Rous hamster ascites tumor, or serum from pigeons with Rous sarcomas which had spontaneously regressed. This indicates that the immune mouse sera do not contain antibodies to soluble, group-specific antigen or the group-specific antigen. It is suggested that cross-reacting MSA observed in normal chick embryo cells could either be induced by avian leukemia virus present as a contaminant or that some components of the cell surface may be the same in mice and chickens. Another possibility is that some chick antigens might have been transduced in mouse tumor cells induced with Rous virus.

- 6816 IMMUNOLOGICALLY ACTIVE GLYCOPEPTIDES DERIVED FROM CEA. (E.) Banjo, C. (McGill U., Dept. Med., Montreal, Canada), P. Gold, S. O. Freedman and J. Krupey. *Ann Immunol (Inst Pasteur)* 124 C(4):575-577, 1973.

Immunologically active glycopeptides were prepared

from CEA obtained from a single patient with adenocarcinoma of the colon. Sialic acid does not play a role in the immunodominant groupings of CEA, whereas N-acetylglucosamine plays a central role in the determinant grouping. Aspartic acid or asparagine and glutamic acid or glutamine were the major amino acids in the purified glycopeptides, indicating that either or both may be covalently bonded to the carbohydrate moiety of CEA. The model compound 2-acetamido-1-N-(4'-L-aspartyl)-2-deoxy-B-D-glucopyranosylamine was capable of inhibiting by 60% the CEA-anti CEA binding.

- 6817 THE FATE OF METHYLCHOLANTHRENE TUMOR CELLS IN BONE: ANALYSIS OF IMMUNE FACTORS IN HOST RESISTANCE. (E.) McLaughlin, A. P., III (U. California Sch. Med., San Diego), W. O. Kessler, P. L. Clark and R. F. Gittes. *J Surg Res* 14(3):186-192, 1973.

A highly immunogenic methylcholanthrene (MCA)-induced fibrosarcoma was used to immunize female C57/BL mice. Once resistance against this tumor was established, the animals were rechallenged by tumor isografts injected directly into the bone to determine whether the bone was an immunologically privileged site for metastatic tumor cells. The results indicated that the structural characteristics of the bone did not protect the tumor cells from destruction by immune lymphocytes. In a second experiment, sera were obtained from female C57/BL mice which had been immunized with a third generation MCA induced tumor. An isotopic antiglobulin assay showed that no significant difference in antibody activity was present in the test sera as compared with normal control sera. Thus, the tumor-specific immunity in C57/BL mice to the specific MCA sarcoma studied is unrelated to circulatory isoantibody and that *in vivo* tumor growth is not influenced by serum factors which may either abrogate or enhance lymphocyte cytotoxicity.

- 6818 TRANSPLANTATION OF INTESTINAL CARCINOMA IN INBRED RATS. (E.) Martin, M. S. (Natl. Inst. Hlth. Med. Res. Unit 45, Dijon, France), H. Bastien, F. Martin, R. Michiels, M. R. Martin and E. Justrabo. *Biomedicine* 19(12):555-558, 1973.

Intestinal carcinomas were induced in BD-IX rats by weekly injections of 1,2-dimethylhydrazine and carcinomas of the glandular stomach and small intestine were induced in Lewis rats by orally administered N-methyl-N'-nitro-N-nitroso-guanidine. Fifty-five such tumors were then transplanted into syngeneic hosts. Most of the attempts to establish transplantable carcinoma lines were unsuccessful, although there was a higher rate of success when the hosts were irradiated or treated with cortisone. Seven lines of serially graftable carcinomas were established, most of which were transmitted s.c. The transplanted tumors maintained the morphological characteristics of the original carcinomas through the successive passages. Histologically, these carcinomas resembled human colorectal adenocarcinomas.

- 6819 LYMPHOCYTE TRANSFORMATION IN CANCER PATIENTS. (E.) Ding, M. J. (Inst. Microbiol., Natl. Defense Med. Ctr., Taipei, Taiwan), C. S. Lai and S. H. Han. *Chinese Med J* 19(3):165-171, 1972.

The lymphocyte response to phytohemagglutinin (PHA) was studied in 24 patients with various nonlymphoid cancers and 7 noncancer subjects. Lymphocyte transformation measured by the rate of DNA synthesis was significantly higher in the 7 control subjects. Although there was a wide variation in the cancer group, most of the lymphocyte preparations from these people gave a low count. The impairment of lymphocyte transformation was related to the physical condition of the patient and the degree of metastasis of the tumor. The impairment of cell-mediated immunity in the patients with the nonlymphoid tumors appeared to be a result of the disease and the development of cancer does not appear to be dependent on an impairment of cell-mediated immunity.

- 6820 THE USEFULNESS OF IMMUNOLOGICAL TESTS IN ONCOLOGY. (Fr.) Cerottini, J.-C. (Swiss Inst. Exp. Res. Cancer, Lausanne, Switzerland), J.-P. Mach and H. Isliker. *Helv Chir Acta* 40(5/6):551-559, 1973.

- 6821 THE VALUE OF DETERMINING ALPHA₁-FETOPROTEIN IN OBSTETRICS. (Fr.) Hartmann, J.-M. (U. Hosp. Ctr., Strasbourg, France), M.-L. North, M. Schwartz and P. Dellenbach. *J Gynecol Obstet Biol Reprod (Paris)* 2:511-532, 1973.

- 6822 INDUCTION OF PHAGOCYTIC ACTIVITY IN IMMATURE LEUKEMIC GRANULOCYTES BY DIBROMOMANNITOL. (E.) Barbour, G. (VA Hosp., Little Rock, Ark.), B. L. Soloff and F. Padilla. *Oncology* 28(5):428-438, 1973.

- 6823 SUBCUTANEOUS GROWTH AND TRANSPLANTATION OF THE RS 1 RAT TUMOR INTO ADULT UNCONDITIONED GOLDEN HAMSTERS. (E.) Encut, I. (Oncol. Inst., Bucharest, Romania) and L. Cioloca. *J Natl Cancer Inst* 51(5):1701-1703, 1973.

- 6824 IMMUNOLOGIC REACTIVITY TO WEAK TRANSPLANTATION ANTIGENS: FACTORS WHICH FAVOR SENSITIZATION RATHER THAN TOLERANCE. (E.) Streilein, J. W. (U. Texas Southwestern Med. Sch., Dallas) and J. S. Streilein. *J Natl Cancer Inst* 51(5):1589-1595, 1973.

- 6825 AN IMMUNOLOGICAL STUDY ON THE EFFECTS OF A COUPLED TUMOR PROTEIN ANTIGEN (LEWIS CTPA) ON THE GROWTH OF TRANSPLANTED TUMORS IN INBRED MICE. (E.) Phillip, M. J. (U. Detroit Sch. Dentistry, Michigan), S. M. Cultrona and D. L. Porcelli. *Oncology* 28(4):306-312, 1973.

- 6826 IMMUNOLOGIC HOMOGENEITY AND ELECTROPHORETIC HETEROGENEITY OF MOUSE MELANOMA TYROSINASES. (E.) Ohtaki, N. (Tokyo Med. Dental U., Japan) and K. Miyazaki. *J Invest Dermatol* 61(6):339-343, 1973.

- 6827 INCREASED REACTIVITY OF MOUSE SPLEEN CELLS SENSITIZED *IN VITRO* AGAINST SYNGENEIC TUMOR CELLS IN THE PRESENCE OF A THYMIC HUMORAL FACTOR. (E.) Carnaud, C. (Weizmann Inst. Sci., Rehovot, Israel), D. Ilfeld, I. Brook and N. Trainin. *J Exp Med* 138(6):1521-1532, 1973.

- 6828 SENSITIVITY TO NORMAL BRAIN ANTIGENS OF BLOOD LYMPHOCYTES FROM PATIENTS WITH GLIOMAS. (E.) Wahlström, T. (Dept. Pathol., U. Helsinki, Finland). *Acta Pathol Microbiol Scand [B]* 81(6):763-767, 1973.

- 6829 STUDY OF SOME TISSUE ANTIGENS AND CULTURED CELLS OF MOUSE HEPATOMA XXIIa. (Rus.) Aleksanian, Iu. T. (Inst. Exp. Biol., Acad. Sci. Armenian SSR), K. S. Movsesian and L. A. Arakelian. *Biol Zh Armenii* 26(10):88-89, 1973.

- 6830 EFFECTS OF VARIOUS MITOGENS ON THE PHOSPHOLIPID METABOLISM OF HUMAN PERIPHERAL LYMPHOCYTES. (E.) Masuzawa, Y. (Pharm. Sci. Fac., U. Tokyo, Japan), T. Osawa, K. Inoue and S. Nojima. *Biochem Biophys Acta* 326(3):339-344, 1973.

- 6831 TRANSPLANTATION OF ALLOGENEIC TUMORS IN RATS TREATED WITH ANTILYMPHOCYTE SERUM. (E.) Kellen, J. A. (Dept. Clin. Biochem., U. Toronto, Ontario, Canada). *Oncology* 28(5):439-444, 1973.

- 6832 THE EFFECT OF PHYTOHAEMAGGLUTININ ON THE ANTIBODY RESPONSE IN MICE BEARING ASCITES TUMOR. (E.) Mekori, T. (Rambam Government Hosp., Haifa, Israel) and E. Robinson. *Oncology* 28(6):481-491, 1973.

- 6833 IMMUNOSUPPRESSION MEDIATED BY EHRlich ASCITES FLUID. (E.) Hrsak, I. ("Ruder Boskovic" Inst., Zagreb, Yugoslavia) and T. Marotti. *Eur J Cancer* 9(10):717-724, 1973.

- 6834 CARCINOEMBRYONIC ANTIGEN (CEA) IN THE PLASMA AND URINE OF PATIENTS WITH UROLOGIC CANCER. (E.) Thitprasert, A. (No affiliation), R. Ablin, I. Bush and P. Guinan. *Proc Inst Med Chic* 29(9):323, 1973.

- 6835 DEVELOPMENT AND USE OF TUMOR SPECIFIC ANTISERA (ANTI ALPHA FETOPROTEIN FOR DIAGNOSIS OF CARCINOMA OF LIVER). (E.) Nerenberg, S. (No affiliation). *Proc Inst Med Chic* 29(9):311, 1973.

- 6836 HEALING AND RECURRENCE OF CANCER — FROM A POINT OF VIEW OF IMMUNOLOGY. (Jap.)

Yoshida, T. (Aichi Cancer Ctr., Res. Inst. Hosp., Japan), H. Imanaga, E. Yamada, S. Miyaishi, Y. Kuroyanagi, H. Nakasato, A. Koike, K. Suzuki, O. Kato, T. Kido, H. Takagi, M. Yasue, K. Morimoto, S. Satake, Y. Yasuda, K. Nakamura, T. Takahashi, Y. Nishijima, H. Yamamoto, Y. Ito, T. Akaza and T. Suchi. *Jap J Cancer Clin* 19(4):308-316, 1973.

- 6837 FREE AMINO ACIDS IN E.L.4 MOUSE ASCITES TUMOR CELLS TAKEN FROM SUSCEPTIBLE

(C57BL) AND RESISTANT (B10.D2) MICE. (E.) Wein, J. (City of Hope Natl. Med. Ctr., Duarte, Calif.), E. Roberts, M. Fox and C. Weinstein. *Cancer Res* 33(11):2987-2991, 1973.

- 6838 ISOLATION OF TUMOR-LOCALIZING ANTIBODIES WITH IMMUNOABSORBANTS. I. MODEL INVESTIGATIONS ON THE HORSE SERUM ALBUMIN/HORSE ANTI-SERUM ALBUMIN SYSTEM. (Ger.) Teichmann, B. (Ctr. Inst. Cancer Res., Berlin-Buch, German Democratic Republic) and R. Vogt. *Arch Geschwulstforsch* 42(3):212-225, 1973.

- 6839 CELL SURFACE CONSTITUENTS OF SARCOMA 180 ASCITES TUMOR CELLS. (E.) Shin, B. C. (Dept. Biochem., Oklahoma State U., Stillwater) and K. L. Carraway. *Biochem Biophys Acta* 330(3):254-268, 1973.

- 6840 SPONTANEOUS REGRESSION OF MALIGNANT MELANOMA. (E.) Doyle, J. C. (U. Melbourne, St. Vincent's Hosp., Australia), R. C. Bennett and R. K. Newing. *Med J Aust* 2(11):551-552, 1973.

- 6841 IMMUNOLOGICAL STUDIES OF RUNTING SYNDROME IN RATS INOCULATED WITH FRIEND VIRUS. (E.) Takeichi, N. (Cancer Inst., Hokkaido U. Sch. Med., Sapporo, Japan), N. Kuzumaki and H. Kobayashi. *Cancer Res* 33(12):3096-3102, 1973.

- 6842 MALIGNANT TUMORS ASSOCIATED WITH IMMUNOSUPPRESSION: A NEW PROBLEM IN TRANSPLANT RECIPIENTS. (Ger.) Enderlin, F. (Cantonal Hosp., Basel, Switzerland) and Y. Guisan. *Praxis* 62(34):1031-1036, 1973.

- 6843 DETECTION OF CARCINOGENS USING THE MUTATION INDUCING ACTIVITY OF MICRO-ORGANISMS. (Jap.) Kada, T. (Natl. Inst. Genetics Res., Japan). *Gann* 11(3):191-195, 1973.

- 6844 LOCALIZATION OF HUMAN GW-39 TUMORS IN HAMSTERS BY RADIOLABELED HETEROSPECIFIC ANTIBODY TO CARCINOEMBRYONIC ANTIGEN. (E.) Primus, J. (U. Kentucky Med. Ctr., Lexington), R. J. Wang, D. M. Goldenberg and H. J. Hansen. *Cancer Res* 33(11):2977-2982, 1973.

See also:

- * (Rev): 6601, 6602, 6613, 6618, 6640, 6642, 6645, 6648, 6650, 6670
- * (Chem): 6682, 6725
- * (Viral): 6747, 6749, 6768, 6771, 6782
- * (Epid-Biom): 6877, 6905

- 6845 NONFIBROBLASTIC ORIGIN OF FOREIGN BODY SARCOMAS IMPLICATED BY HISTOLOGICAL AND ELECTRON MICROSCOPIC STUDIES. (E.) Johnson, K. H. (Coll. Vet. Med., St. Paul, Minn.), H. K. G. Ghobrial, L. C. Buoen, I. Brand and K. G. Brand. *Cancer Res* 33(12):3139-3154, 1973.

Twenty foreign body sarcomas induced in CBA/H, CBA/H-T6, or AKR mice by s.c. implantation of foreign body material were investigated histologically and by electron microscopy in search of morphological characteristics which would indicate the cell of origin. Eighteen of these sarcomas generally conformed to classes of anaplasticity defined earlier. Myxoid areas were apparent in two of these sarcomas. In addition, a hemangiosarcoma and a bone-forming sarcoma were studied. In spite of the heterogeneity of sarcoma types obtained in this study, all sarcomas were characterized by: pericellular, periodic acid-Schiff-positive, argyrophilic, and filamentous substance resembling basal lamina; a sparsity of collagen production; and prominent cytoplasmic accumulations of 60-Å microfilaments in 60 to 100% of the cells from each sarcoma. Sarcomas from six mice with leiomyomatous cells, containing extensive concentrations of microfilaments, also had many acid fuchsin-positive cells when examined with the light microscope. The consistent presence of these morphological characteristics despite the variability of histological sarcoma types suggests that a pluripotential mesenchymal cell type other than the fibroblast is the common progenitor cell. This cell must be derived from the local tissue at the implantation site since chimera studies have already excluded radiosensitive stem cells of the bone marrow as the source. The pericyte, besides closely related cell types that are a fixed structural part of the microvascular bed (i.e., endothelial cells and smooth muscle cells), was considered to be the most likely progenitor cell because: it possesses mesenchymal pluripotentiality to account for the histological variety within and between sarcomas, and it possesses subcellular morphological features compatible with those seen in the tumor cells. Virus particles were present in 15 of 20 sarcomas studied. Intracisternal type A particles were demonstrated in 12 of 17 sarcomas of CBA/H and CBA/H-T6 animals (or their hybrids) while 3 of 3 sarcomas induced in ARK mice contained immature type C particles. The significance of virus particles associated with foreign body sarcomas remains to be determined.

- 6846 EPIDEMIOLOGIC AND IMMUNOLOGIC CONSIDERATIONS ON THE PATHOGENESIS OF BURKITT'S TUMOR. (E.) Krüger, G. (Natl. Cancer Inst., Bethesda, Md.) and G. T. O'Connor. *Recent Results Cancer Res* 39:211-224, 1972.

The occurrence of Burkitt's tumor has been found to vary according to a peculiar geographic distribution. It does not occur in mountainous country, is most commonly found around lakes, and occurs preferentially in areas with a mean minimum temperature of 15 to 18 C. Because of its consistent association with Burkitt's tumor, the Epstein-Barr

virus (EBV) is suspected of having an etiologic association with the disease. In addition, Burkitt's tumor is frequent only in areas with a holoendemic malaria. The associations between Burkitt's lymphoma, malaria, and EBV has generated a variety of immunological and immunopathological theories. Animal studies have indicated that the role of the virus in the induction of Burkitt's lymphoma is probably one of immunologic stimulation rather than direct oncogenicity. It has been suggested that a vertically transmitted viral genome or portion thereof results in tumor induction when switched on in some way. In the case of lymphoreticular neoplasms, persistent antigenic stimulation coupled with immunosuppression may represent part of this switch-on mechanism. It appears that the suppression of cellular immunity is more important for lymphoma development than is the inhibition of antibody formation.

- 6847 METASTASIS OF ESOPHAGEAL CANCER. (Rus.) Pirigov, A. I. (P. A. Gertsen Sci. Res. Inst. Oncol., Moscow, USSR) and V. D. Ryndin. *Vopr Onkol* 9(12):3-9, 1973.

Metastasis formation was studied on the basis of autopsy reports on 710 patients with esophageal cancer. These patients consisted of 425 men (60%) and 285 women (40%). Metastases were present in 421 (59.2%): in 60.5% of the men and 56.8% of the women. Metastasis occurred most frequently (74%) in patients 70 yr old or older. Lymph-borne metastases were significantly more common (56.0%) than blood-borne metastases (24.0%); the latter metastases occurred most frequently with poorly differentiated forms of cancer. The percentage of patients who developed metastases depended upon the duration of the disease and the degree of tumor differentiation. However, metastases were present in more than half of the patients even when the history dated back less than 6 months or when the tumor was less than 5 cm in diameter (55.5% and 68.0%, resp.). This was most evident when the tumor was undifferentiated. Metastases were found in 49% of patients who died shortly after radiotherapy and in 30.0% of those who died shortly after surgery. The lymph nodes and organs below the diaphragm were involved in 13.2% of those who died after radical surgery and in 17.8% of those who died after radiotherapy. This confirms the advisability of removing and biopsying paracardial lymph nodes and often those of the lesser omentum and retroperitoneal space before performing radical surgery. The site of lymph node metastases depended upon the site of the tumor in the esophagus.

- 6848 METASTATIC SPREAD OF OSTEOSARCOMA. (E.) Price, C. H. G. (Bristol Royal Infirmary, Great Britain) and G. M. Jeffree. *Br J Cancer* 28(6):515-524, 1973.

Between 1946 and 1972, the Bristol Bone Tumour Registry recorded 123 cases of osteosarcomas occurring in otherwise normal long bones and 26 cases of such tumor occurring in all other sites. Although the best results were obtained when the long bone

tumors were treated surgically rather than radiotherapeutically or with preoperative radiotherapy, these results were not statistically significant and the information was recorded primarily to assist in the evaluation of new forms of treatment for occult and overt metastases. Among the patients with the long bone tumors, the crude survival and mean disease-free interval (DFI) were better for patients older than 25 yr. The crude and mean disease free survival rates were nonsignificantly better for females, and these rates did not differ according to the tumor site.

- 6849 ETIOLOGY OF BURKITT'S LYMPHOMA. (E.) de-The, G. (International Agency Res. Cancer, Lyon, France). *Recent Results Cancer Res* 39:225-226, 1972.

The epidemiology of Burkitt's lymphoma (BL) indicates that a vector transmitted factor plays a role in the development of the tumor, while a serological association between the Epstein-Barr virus (EBV) and this disease implicates an etiological role of the virus. There are four hypotheses regarding the relationship between EBV and BL: there is no causal relationship between EBV and BL; EBV infection is necessary for the development of BL, which appears clinically after a fairly short latent period; BL develops in children who have a long and heavy exposure to EBV; and there is a causal relationship between EBV and BL which involved long and variable latent periods. To test the first three hypotheses (the fourth cannot be examined within the proposed framework), a field study is proposed. The role of malaria as a possible co-factor would also be investigated.

- 6850 PROPHYLAXIS OF SPONTANEOUSLY DEVELOPING MAMMARY CARCINOMA IN C3H/HeJ FEMALE MICE BY SUPPRESSION OF PROLACTIN. (E.) Welsch, C. W. (Dept. Anat., Michigan St. U., East Lansing) and C. Gribler. *Cancer Res* 33(11):2939-2946, 1973.

Daily treatment for 1 yr of young nulliparous C3H/HeJ mice with 2-bromo- α -ergocryptine (CB-154), an efficacious inhibitor of prolactin secretion, markedly suppressed mammary hyperplastic alveolar nodular development and virtually eliminated the appearance of mammary tumors. Mature multiparous C3H/HeJ mice treated similarly also had reduced numbers of hyperplastic alveolar nodules and decreased mammary tumor incidence, but the response to the ergot was not as striking as that observed in the younger nulliparous mice. 2-Bromo- α -ergocryptine treatment was, however, generally ineffective in promoting the regression of palpable mammary tumors in mature multiparous C3H/HeJ mice. Treatment with 2-bromo- α -ergocryptine had no significant effect on pituitary, ovarian, uterine, adrenal, or body weight, nor did it alter the estrous cycles. The results suggest that prolactin is an important, perhaps essential, hormone in the developmental phases of mouse mammary tumorigenesis. However, this hormone is of considerably less importance in the more advanced stages of the disease.

Upon the establishment of the hormone as a prerequisite for the development of human breast cancers, the use of appropriate drug-mediated hormone suppression as a prophylactic treatment for the disease may become feasible.

- 6851 PRECANCEROUS STAGES OF THYROID TUMORS. (Ger.) Berchtold, R. (Inselspital, Bern, Switzerland), P. A. Gretillat, M. P. König, E. Pedrinis, H. Roesler and D. Allgöwer. *Helv Chir Acta* 40(5/6):587-592, 1973.

The reliability of cytological diagnosis of thyroid tumors was assessed by comparing the results of cytological and histological examinations of cold nodules removed from the thyroids of 100 patients. Of 65 patients with histologically nonmalignant tumors, 3 had cytological diagnoses of malignant tumors (2 papillomas) and 3 of potentially malignant tumors at surgery. All 14 tumors which were found to be potentially malignant on cytological examination were confirmed to be potentially malignant (large-cell adenomas) on histological examination. Only epithelial atypia was found by histological examination in one of eight tumors which were possibly malignant on cytological examination. Histological and cytological results were in agreement on 12 of 13 tumors diagnosed as definitely malignant by the cytological method; the remaining tumor was a large-cell adenoma. Large-cell adenomas, trabecular tumors and possibly microfollicular and papillomatous tumors are considered to be potentially malignant.

- 6852 A QUANTITATIVE COMPARISON BETWEEN NORMAL AND CARCINOMATOUS SQUAMOUS EPITHELIA OF THE UTERINE CERVIX. (E.) Wiernik, G. (Churchill Hosp. Res. Inst., Oxford, England), S. Bradbury, M. Plant, R. H. Cowdell and E. A. Williams. *Br J Cancer* 28(6):488-499, 1973.

Some of the differences between normal squamous epithelial cells and cells from invasive squamous carcinoma of the uterine cervix were studied. A total of 107 patients were studied; only those specimens which when assessed by a histopathologist were thought to show classic normal features or undoubted invasive carcinoma were included in the quantitative analysis. In addition, any specimens which showed faulty sampling or preparation at the electron microscope level were discarded, leaving 16 carcinoma and 15 normal specimens for detailed study. The nuclei of the tumor cells had a greater area than those of the normal cells; histograms of the size distribution of these nuclei showed a distinctly different pattern in the two groups. The tumor cells had fewer ribosomes in each cubic micron of cytoplasm than did the normal cells, and they showed a reduction in the amount of intercellular space; in addition, the malignant cells had a smaller surface density and fewer tonofibrils in their cytoplasm. Some tumor cells had a smaller percentage of cell membrane specialized as desmosomes than the corresponding normal cells, but all tumor cells had desmosomes of shorter length than normal. Discrim-

inatory analysis, carried out with the help of a computer, allowed all of these variables to be assessed with respect to each other in order to arrive at a numerical score for each specimen. When expressed graphically, these scores showed that the populations of normal and carcinomatous cells fell into two separate groups.

- 6853 CLINICAL AND MORPHOLOGICAL CORRELATIONS IN STOMACH PRECANCER AND CANCER. (Rus.) Pavlov, K. A. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR) and N. M. Smirnov. *Vopr Onkol* 19(12):15-21, 1973.

The fibergastroscope was used to examine 1805 patients and to take biopsies from various parts of the gastric mucosa in 1144 (63.4%). Histological examination of biopsied material showed the mucosa was essentially normal in 435 cases (38.0%), atrophic or changed in 465 (40.7%), and contained areas of atypical epithelial proliferation in 20 (1.7%). Adenomatous polyps were present in 33 patients and proliferating polyps in 7 for a total of 3.5%. Chronic gastric ulcers were found in 47 (4.1%), stomach cancer in 122 (10.7%), and other abnormalities in 15 (1.3%). On the basis of clinical and morphological examinations, stomach cancer was diagnosed in 128 patients. Of these 128 tumors, 38 (26.9%) ranged from 1-4 cm in diameter. These small tumors included 7 preinvasive tumors, 8 which invaded the submucosa, 12 which involved the muscularis, and 11 which involved all layers of the stomach wall.

- 6854 SOME ASPECTS OF MORPHOGENESIS OF CARCINOMA MAMMAE. (E.) Gabunia, U. A. (A. N. Natishvili Inst. Exp. Morphology, Acad. Sci. Georgian SSR, Tbilisi). *Folia Histochem Cytochem* 11(3-4):169-176, 1973.

To define precisely the role played by the parenchymatous cells of mammary carcinomas in the synthesis of sulfated mucopolysaccharides and collagen proteins, mammary tumor-bearing animals were given i.p. injections of $\text{Na}_2^{35}\text{SO}_4$ and (^{14}C)proline. The incorporation of isotopes into the neoplastic tissues was quantitatively assessed using track emulsion autoradiographs. $\text{Na}_2^{35}\text{SO}_4$ was found in the parenchymatous cells of the neoplastic parenchyma as early as 15 min after administration; incorporation of the label reaches a maximum within 6 hr, after which the isotope content in the neoplasm gradually decreases. The neoplastic cells also showed some accumulation of (^{14}C)proline within the first 15 min postinjection; maximal incorporation is reached after 1 hr and this level is maintained for 2 hr, after which the isotope content gradually decreases. With time, the levels of both isotopes within the carcinoma cells decreased, while simultaneously increasing in the intercellular substance. Thus, both the labeled sodium sulfate and the (^{14}C)proline are utilized by the carcinoma cells in the synthesis of sulfated mucopolysaccharides and proline-containing proteins, which are needed for the formation of fibrillary structures of the carcinoma stroma. Additional data indicate that the myoepthe-

lial cell is probably the structure which initiates the development of mammary carcinomas.

- 6855 THE DEVELOPMENT OF TSH PRODUCING PITUITARY TUMOURS IN THE MOUSE. (E.) Dingemans, K. P. (Dept. Electron Microscopy, Netherlands Cancer Inst., Amsterdam). *Virchows Arch (Zellpathol)* 12:338-359, 1973.

The development in mice of TSH producing pituitary tumors induced by severe thyroid inhibition was analyzed over a period of 47 weeks. This was done on the basis of the gland weights, counts, and measurements of the cells with the aid of the electron microscope, calculation of changes in the absolute number of cells per hypophysis, autoradiography after ^3H -thymidine labeling, and morphological observations at the ultrastructural level. The results indicate that there was a short initial phase during which the thyroidectomy cells had a high mitotic activity, followed by a phase that lasted for several months during which the mitotic activity was at a much lower level, so that growth proceeded slowly. After 38 weeks, sharply demarcated nodules of rapidly proliferating thyroidectomy cells were found in most hypophyses. These nodules must have originated very early in the process of tumor formation. The morphology as well as the size of the thyroidectomy cells remained constant during the experiment, except for those in the nodules which were morphologically very different and that were considerably smaller. All other hormone-producing cells were virtually unaffected during most of the experimental period. A comparison was made between the results presented here and a mathematical model of the development of TSH producing pituitary tumors that was proposed by Clifton. In addition to many points of correspondence, some discrepancies appeared to exist.

- 6856 MORPHOGENESIS OF ADENOMATOUS POLYPS OF THE LARGE INTESTINE. (Rus.) Levin, V. N. (Leningrad Med. Inst. Sanit. Hyg., USSR). *Vopr Onkol* 19(12):81-83, 1973.

The morphogenesis of adenomatous polyps of the large intestine is discussed on the basis of observations made on 113 simple and 135 proliferating adenomatous polyps in various stages of development. Simple polyps were more common in men (65) than in women (46) and were seen primarily in patients aged 30-49 yr, while proliferating polyps were more common in women (89) than in men (46) and occurred primarily in patients aged 40-59 yr. Both types occurred as single and multiple polyps, and the majority were located in the rectum. The earliest stages in the development of simple adenomatous polyps closely resembled hyperplastic mucosa. These polyps developed from proliferation of goblet cells in the crypts, the surface epithelium, and underlying connective tissue, and resembled folds in the mucosa. Then a spike of connective tissue formed in the polyp-fold and fixed the polyp in a vertical position. The polyp-fold became a polyp on a wide base or a narrow pedicle. Proliferating adenomatous polyps could develop either from simple adenomatous polyps or de

novus. In the first case dark proliferating epithelium displaced the surface epithelium and glandular cells of the simple polyp. In the second case these dark cells developed on the surface of the unchanged mucosa.

- 6857 EPIDERMODYSPLASIA VERRUCIFORMIS. II. URIDINE INCORPORATION. (E.) Delescluse, C. (Lab. Res. Human Skin Tumors, Paris, France), M. Regnier and M. Prunieras. *Arch Dermatol Forsch* 247(1):89-97, 1973.

The incorporation of tritiated uridine into skin specimens from four unrelated cases of Epidermodysplasia Verruciformis (EV) was studied and the results compared with those obtained using specimens from 9 healthy human donors. As compared with the normal skin samples, consistent disturbances were found in the labeling of epidermal keratinocytes in the warty lesions. There was a decrease in the number of labeled cells, the large pale dysplastic cells characteristic of EV consistently remained unlabeled, and this lack of labeling extended to groups of normal looking keratinocytes, including the basal cells of two EV patients. The data indicate that EV patients do not have an inherent genetic defect.

- 6858 CANCER OF THE KIDNEY - NATURAL HISTORY AND STAGING. (E.) Holland, J. M. (Northwestern Univ. Med. Sch., Chicago, Ill.). *Cancer* 32(5):1030-1042, 1973.

- 6859 MORPHOGENESIS AND HISTOLOGICAL CLASSIFICATION OF NEVOCELLULAR NEVUSES. (Rus.) Gordeladze, A. S. (Leningrad Med. Inst. Sanit. Hyg., USSR). *Arkhl Patol* 35(8):23-30, 1973.

- 6860 ASSESSMENT OF THE STATE OF THE BLOOD COAGULATION AND ANTICOAGULATION SYSTEMS IN BERYLLIOSIS VIEWED IN THE LIGHT OF ITS MORPHOGENESIS. (Rus.) Shatskaya, N. N. (Med. Inst. Moscow, USSR). *Gig Tr Prof Zabol* (12):31-36, 1973.

- 6861 EARLY SURGICAL DIAGNOSIS OF BREAST TUMORS UNDERGOING MALIGNANT TRANSFORMATION. (Fr.) Meyer-Furst, P. (Hirslanden Private Clin., Zurich, Switzerland). *Helv Chir Acta* 40(5-6):803-808, 1973.

- 6862 PATHOGENESIS OF POLYPOSIS OF THE LARGE INTESTINE. (Rus.) Malyshev, Iu. I. (D. I. Ul'ianov Med. Inst., Kuibyshev, USSR), E. N. Katorkin, G. P. Pyteva and V. M. Rusakov. *Kazan Med Zh* (5):15-18, 1973.

- 6863 FOLLICULAR LYMPHOMA — PRESENCE OF TUMOR ORIGINATING FROM GERMINAL CENTER. (Jap.) Kojima, M. (Dept. Pathol., Fukushima Med. Coll., Japan), Y. Imai and N. Mori. *Jap J Cancer Clin* 19(5):401-407, 1973.

- 6864 MICROSPECTROPHOTOMETRIC MEASUREMENT OF THE DNA CONTENT IN DIAGNOSING PREMALIGNANT PROCESSES AND CANCER. (Rus.) Avtandilov, G. G. (Inst. Human Morphology, Moscow, USSR) and I. A. Kazantseva. *Arkhl Patol* 35(1):13-17, 1973.

- 6865 MASTOPATHY AND CARCINOMA: A CLINICAL AND PATHOLOGICAL COMPARISON. (Dut.) van Slooten, E. A. (Antoni van Leeuwenhoek Hosp., Amsterdam, Netherlands) and J. F. Hampe. *Ned T Geneesk* 117(5):188-193, 1973.

- 6866 THE CONTENT OF NUCLEIC ACIDS IN THE ENDOMETRIUM IN HYPERPLASTIC PROCESSES. (Rus.) Breusenko, V. G. (Moscow Regional Sci. Res. Inst. Obstet. Gynecol., USSR). *Akush Ginekol* (5):12-14, 1973.

- 6867 THE PERIANAL FISTULAS AS A PRECANCEROUS STATE. (Rus.) Kalceva, V. (I. P. Pavlov Higher Inst. Med., Plovdiv, Bulgaria), M. D. Tileva and I. Peeva. *Folia Med (Plovdiv)* 15(1):33-38, 1973.

See also:

- * (Rev): 6609, 6610, 6612, 6627, 6631, 6669
- * (Chem): 6674
- * (Epid-Biom): 6919

- 6868 HODGKIN'S DISEASE IN JAPAN. (E.)
Kageyama, K. (Keio U. Sch. Med., Japan),
A. Mikata and S. Watanabe. *Gann Monograph on Cancer*
Res 15:239-252, 1973.

A review of 309 cases diagnosed as Hodgkin's disease indicated that this diagnosis was acceptable in only 186 cases. Application of the Rye classification resulted in the following breakdown: MC, 58.6%; NS, 15.6%; LD, 20.4%, and LP, 5.4%. Females outnumbered males in incidence in the NS group. Retrospective survey of 40 autopsy cases revealed a very short survival of Japanese Hodgkin's cases, partly due to the small number of NS cases. Morphometric study disclosed that the nucleolus of Hodgkin's cells was about $15 \mu^2$ in area, three-fold that of normal reticulum cells. Nucleolar against nuclear area ratio was also the highest in Hodgkin's cells. The study indicated that Hodgkin's disease can be divided by its histological features into an early stage group, a group with characteristic granulomatous process, and a sarcomatous group. Among those cases not accepted as Hodgkin's disease, there were some very closely resembling Hodgkin's disease. In these cases the histological features resemble either LP, MD or LD reticular type, but lack typical diagnostic Reed-Sternberg's or Hodgkin's cells. Although about one-third of these cases were diagnosed as Hodgkin's disease after subsequent biopsies, some of the cases remained as such and some terminated in reticulum cell sarcoma. Careful detailed study should be carried out before making a conclusive diagnosis of these atypical forms.

- 6869 POTENTIAL HAZARD: EXPLOSIVE PRODUCTION OF MUTATIONS BY INDUCTION OF MUTATORS. (E.) Morgan, K. (Dept. Genetics, U. Alberta, Canada), P. J. Hastings and R. V. von Borstel. *Environ Health Perspect* (6):207-210, 1973.

The induction of mutator mutants with any enhanced frequency could be more hazardous to a population than induction of standard sublethal and lethal defects. The fate of mutator genes which affect equally the rates of production of both forward and backward mutations at another locus in haploid populations is determined by natural selection in sexual populations which favors the lowest possible mutation rate. However, given certain conditions, considerable variation among isolated populations in the frequencies of mutator activity is possible. Appreciable frequencies of a single deleterious recessive allele can be attained in populations which now may be large but which evolved in isolation from a small group of founders with an early phase of rapid population growth. Considering the population dynamics of a general mutator under conditions of a constant population size and selective disadvantage, if the mutation is completely recessive with respect to fitness the total number of mutant homozygotes is relatively small. However, the expected number of mutant heterozygotes and the average time to extinction of this allele increase as the effective population size increases. If, on the other hand, the single deleterious mutant is partially recessive with respect to fitness, the

total number of affected individuals and the average extinction time are almost independent of the effective population size. Neither the relative frequencies of induction of antimutators and mutators nor the mechanisms by which mutators enhance the induction of mutations is known.

- 6870 TUMOURS OF THE FEMALE GENITALIA. (E.)
James, P. D. (No affiliation), C. W.
Taylor and A. C. Templeton. *Recent Results Cancer*
Res 41:101-131, 1973.

Of 1209 malignant tumors of the genital tract seen among Ugandan women between 1964 and 1968, there were 44 carcinomas of the vulva. These cases showed some tribal variation and, while the incidence was similar to that seen in other countries, the mean age of onset was nearly 10 yr less. The age of onset was also lower with carcinoma of the vagina, 19 cases of which were seen. Carcinoma of the cervix is the most common cancer among Ugandan women and shows considerable tribal variation. Forty-nine cases of endometrial carcinoma were seen, the incidence for this cancer being lower in Uganda than in other countries. Environmental factors appear to play a role in the pathogenesis of uterine cancer. Carcinoma and sarcoma of the uterine body are uncommon in Uganda, accounting for 10.2% of uterine malignancies; the mean age at presentation is lower than that reported elsewhere. Twelve chorioadenoma destruens, 55 choriocarcinomas, and 224 hydatidiform moles were seen; they are discussed in terms of their incidence, tribal variation, age of onset, relation to parity, pathology, and predisposing lesions. Ovarian tumors consisted of 394 benign and 206 malignant epithelial tumors, a large number of ovarian teratomas (accounting for 25.4% of all ovarian tumors), and a variety of other types of tumors. Nine cases of carcinoma and one fibrosarcoma of the fallopian tube were also seen.

- 6871 MALIGNANT TUMOURS OF THE KIDNEY, BLADDER AND URETHRA. (E.) Anthony, P. P.
(No affiliation). *Recent Results Cancer Res*
41:145-170, 1973.

Between 1964 and 1968, there were 262 primary malignant tumors of the kidney, bladder, and urethra in Uganda. The majority of the malignant neoplasms of the kidney occurred among children, the incidence among adults being lower than in the rest of the world. Fifty-six cases of nephroblastoma were seen, the general incidence being similar to that in other countries. The age, sex, tribal, and geographic distribution of this tumor in Uganda are discussed, as are its microscopic and macroscopic features, etiology, spread, treatment, and prognosis. Adenocarcinoma of the kidney, which is rare in Uganda, is similarly discussed. There were also four carcinomas of the renal pelvis and one case of fibrosarcoma seen in this series. Carcinoma of the bladder, which is rare in Uganda compared to other countries, is discussed in terms of transitional cell carcinomas, squamous cell car-

cinomas, adenocarcinomas, anaplastic carcinomas, and nonepithelial malignant tumors of the bladder. There were no cases of vesical schistosomiasis in this series, while in 43 of the 120 cases of histologically classifiable bladder cancer a preexisting urethral stricture was present; both have been implicated in the etiology of bladder cancer. Forty-two histologically confirmed carcinomas of the urethra were seen, the overall picture being similar to that described for carcinoma of the bladder.

- 6872 DERMATOGLYPHICS IN CHILDREN WITH ACUTE LEUKAEMIA. (E.) Purvis-Smith, S. G. (Childrens Med. Res. Fdn., Sydney, Australia) and M. A. Menser. *Brit Med J* 4(5893):646-648, 1973.

Handprints from 135 Caucasian children (77 males and 58 females, aged 4 months to 15 yr) with acute lymphatic or acute blast cell leukemia were studied. Handprints from 249 first degree relatives including 113 siblings, 60 parental pairs and 16 additional mothers were also examined. Under palmar crease analysis, female patients had significantly more simian creases than controls and the total number of anomalous creases (simian plus Sydney) was significantly raised in both female patients and their mothers. A positive association was similarly found between the incidence of anomalous creases in patients and the incidence in their siblings. Thus the possibility of familial occurrence of palmar creases in acute childhood leukemia is suggested. Digital pattern frequencies showed both male and female patients had significantly increased digital pattern complexity, i.e., increased frequency of whorl patterns. No correlation was noted in the patients' mothers, however, their fathers had a highly significant increase in whorl numbers with a corresponding decrease in the numbers of ulnar loops. The pattern intensity and whorl frequency in the fathers was higher than in the patients, suggesting genetic factors are partly responsible for the whorl frequency in these children. The view that genetic factors are involved is strengthened by the finding of relative homogeneity of the patient-sibling groups. The recognition of atypical dermatoglyphic variations in children with leukemia suggests that within the racial group studied the population with these dermatoglyphic traits may be relatively susceptible to leukemogenesis.

- 6873 STUDIES ON THE GROWTH OF INTERMUSCULARLY IMPLANTED SOLID YOSHIDA SARCOMA IN THE RAT. (Ger.) Hartleib, J. (Main-Taunus Reg. Hosp., Bad Soden am Taunus, Germany). *Z Krebsforsch* 80(4):265-268, 1973.

Fragments of tumor tissue, measuring 2 x 2 x 0.5 mm, were removed from solid Yoshida sarcomas, and each fragment was implanted into an incision 0.5-0.7 cm long, which had been made into the muscle on the inner side of the leg of Wistar rats. The muscle was closed with thin catgut and the skin with two fine Supramid sutures. This method was used to implant 16 tumors from Wistar rats into each of five groups of rats,

and a study was made of tumor growth and gross and microscopic morphology. Tumor tissue implanted between the muscle layers in the rat leg grew at a regular rate. Microscopic signs of tumor cell proliferation on the surface of the implant appeared after a latent time of 14 hr. The implant itself became necrotic. Gross evidence of new tumor growth could be seen after six days. There was a constant reproducible relation between the time elapsed from tumor implantation and tumor size, even in the early stages of development when no gross evidence of tumor growth was found. The tumors obtained in this way are similar in their appearance and behavior to micrometastases in man. The method is therefore suitable for model experiments on the behavior of microtumors.

- 6874 TUMOURS OF THE RESPIRATORY TRACT. (E.) O'Connor, G. T. (No Affiliation) and A. C. Templeton. *Recent Results Cancer Res* 41:79-93, 1973.

Between 1964 and 1968, 429 tumors arising in the respiratory tract were seen in Uganda, 78 of which were sarcomas of the nose and sinuses. These tumors are common in Uganda, and are twice as common among males as females. Chronic irritation by a variety of factors is believed to be involved in the pathogenesis of these tumors. Nasopharyngeal cancer is relatively common in certain parts of Uganda. Ninety-five cases of nasopharyngeal cancer were seen in this series, 61 occurring in men. The histological characteristics of these tumors are discussed. Carcinoma of the larynx is rarely diagnosed among Ugandans; only 16 cases were recorded in this series, most of them among males. Carcinoma of the lung and bronchus occurs less frequently in Uganda than in many countries, and it is seen at a lower mean age. Further, the incidence among males and females is nearly equal, while in high incidence countries the incidence among males is five times greater.

- 6875 TUMOURS OF THE SKIN. (E.) Iversen, U. (No affiliation) and O. H. Iversen. *Recent Results Cancer Res* 41:180-199, 1973.

Between 1964 and 1968, 696 malignant epithelial tumors were diagnosed in Uganda, 301 of which were seen in females. Of these tumors, 663 were squamous-cell carcinomas of the skin. The majority of these tumors occurred at the site of previous lesions such as tropical phagedenic ulcers, burns, or bites. The incidence rate of this tumor varies with tribal group and geography. Squamous-cell carcinoma is discussed in terms of its symptoms, histology, and clinical staging. Thirteen basal-cell carcinomas were also seen, along with 73 cases of tumors of the skin accessories. The latter showed a male preponderance among the malignant tumors. The anatomical distribution and histological appearance of the skin tumors occurring among albino Ugandans were different from the pattern seen among normally pigmented individuals. In addition, albinos are at least 1000 times more likely to develop basal cell carcinomas than normally pigmented individuals.

- 6876 DISTRIBUTION OF TUMOURS IN UGANDA. (E.)
Templeton, A. C. (No affiliation), and
M. S. R. Hutt. *Recent Results Cancer Res* 41:1-22,
1973.

As background to a series of articles concerned with the epidemiology of tumors in Uganda, the development of cancer research in Uganda is discussed, along with the history, geography, people, and medical facilities of the country. Diseases other than cancer which are common among Ugandans are malaria, schistosomias, viral infections, ulcers, malnutrition, and venereal disease. Data on cancer cases are taken from the national cancer registry, in which 7347 cases were reported between 1964 and 1968. Only 391 of these reported cases lacked histological confirmation. The registration of malignant tumors in Uganda is incomplete, particularly in the more sparsely populated areas of the country remote from larger hospitals; benign tumors especially are grossly underestimated. Cancer of the soft tissues, penis, liver, and skin were the most common tumors among men, while carcinoma of the cervix, breast, and skin were the most frequently encountered among women.

- 6877 ABO AND RhD BLOOD GROUP IN LEUKEMIC PATIENTS. (E.) Moszczynski, P. (Med.
Acad., Cracow, Poland) and J. Lisiewicz. *Folia Haematol (Leipz)* 100(4):395-400, 1973.

The frequency of ABO blood groups was investigated in a group of 533 leukemia patients of whom 248 had acute leukemia, 141 had chronic granulocytic leukemia, and 144 had chronic lymphocytic leukemia. A significant difference in the frequency of ABO and RhD groups between leukemia patients and the control group of healthy persons was not found at the significance level of $\alpha = 0.01$. The type of leukemia and blood groups of the ABO and RhD system were not significantly correlated.

- 6878 TUMOURS OF THE EYE AND ADNEXA. (E.)
Templeton, A. C. (No affiliation).
Recent Results Cancer Res 41:203-214, 1973.

Between 1964 and 1968, 57 cases of retinoblastoma were seen among Ugandan children. The incidence of the disease per child at risk is similar to that seen in other countries, as is the histological pattern. Patients presented at the hospital late in the course of the disease. Fifty-three cases of invasive squamous carcinoma were also seen. This tumor and its predisposing lesions, the pathogenesis of which appears to be related to ultraviolet light and minor trauma from dust, can be classified into three categories: pingueculae with no dysplasia or only keratinization, pinguecula with dysplasia of the overlying epithelium, and invasive carcinoma. Childhood malnutrition may render invasion easier. Tumors of the eyelids are rare in Uganda, only six being seen in this series (five cases among females). Intraocular melanomas are also extremely rare, apparently due

to genetic factors; one case was seen during the present survey. Sacromas of the face and jaws are frequently seen among Ugandan children. Four soft-tissue tumors involving the orbit were seen in this series. Ten granulocytic sarcomas were seen representing a much higher incidence than occurs in other countries. In addition, there were 13 tumors of the lacrimal gland and four cases of Kaposi's sarcoma. Other conditions which affect Ugandans with relative frequency are orbital inflammations, anterior encephaloceles, and fibrous dysplasia.

- 6879 TUMOURS OF THE ALIMENTARY CANAL. (E.)
Templeton, A. C. (No affiliation).
Recent Results Cancer Res 41:23-56, 1973.

Cancer of the alimentary canal accounted for 9.1% of malignant tumors seen in Uganda between 1964 and 1968; this was a much smaller proportion than in most other countries. Thirty-seven malignant tumors of the lips were seen, with the incidence varying geographically. There were also 20 cases of tumors of the tongue and 256 malignant tumors of the oral cavity. Contrary to the experience in most countries, tumors of the mouth in this series were almost twice as common in females as in males. Tumors of the salivary tissue were found in 211 cases, with the proportion of parotid tumors (45%) being lower than among Caucasian peoples. There was 13 cases of squamous carcinoma of the tonsil and fauces, and 19 cases of lymphoma arising in this region; the age distribution was younger than in other countries, and there was a male preponderance of cases. The incidence of esophageal cancer is relatively low in Uganda, with tumors of the lower part of the esophagus being more common than those of the upper part; in contrast to other countries more females are affected in Uganda than males. Malignant tumors arising in the stomach were seen in 190 cases, although this total represented a gross underestimation of the true incidence; these tumors were twice as common among males. As in other countries, tumors of the small intestine were rare. There were 12 carcinoid tumors and 143 tumors of the colon and rectum. Carcinoma of the colon was rare and cancer of the rectum and anus was relatively much more frequent. The low frequency of colonic cancer correlates with the rarity of diverticular disease and polypi; all these conditions may be modified by dietary factors.

- 6880 TUMOURS OF THE MALE GENITALIA. (E.)
Dodge, O. G. (No affiliation), R. Owor
and A. C. Templeton. *Recent Results Cancer Res* 41:132-144, 1973.

Between 1964 and 1968, 140 tumors of the prostate were diagnosed among Ugandan men, although this figure represents a considerably underestimation of the true incidence of the disease in Uganda. The incidence in Uganda is relatively high compared to other countries, although the histological and clinical features of prostatic tumors resemble those of tumors occurring elsewhere. Eighteen testicular and paratesticular tumors were also seen in this

series; these included three teratomas, three orchioblastomas, and five paratesticular tumors. The incidence of testicular tumors in Africa in general is low. Carcinoma of the penis was diagnosed in 474 cases, making it the most frequently diagnosed cancer among Ugandan men. It usually was seen in the coronal sulcus and the incidence was closely correlated with standards of genital hygiene. Circumcision protects against the development of this tumor even when it is carried out at puberty.

- 6881 EPIDEMIOLOGICAL CONSIDERATION OF LUNG CANCER. (Sp.) Senra Varela, A. (Nat'l. Inst. Oncol., Madrid, Spain) and R. Palmeiro Troitino. *Rev Sanit Hig Publ* 46(5):341-352, 1972.

A survey on the smoking behavior of 200 male Spaniards over 50 yr old who were habitual smokers showed that all had begun to smoke between age 18 to 25 yr. They generally began by smoking one cigarette a day, and ended by smoking one pack a day for 23 to 25 yr. From this information and statistics on the lung cancer mortality, it is estimated that an average period of 30-37 yr must elapse for tobacco to have a carcinogenic effect. Since Spanish women just began smoking in large numbers less than ten yr ago, it will be 20-25 yr before the carcinogenic effect of tobacco can be compared in men and women. An analysis of lung cancer mortality among men for the years 1953, 1960 and 1967 revealed that the absolute mortality increased up to age 65 yr and then began to decrease. However, age-adjusted mortality rates increased up to ages 70-74 in 1953 and 1960 and to ages 75-80 yr in 1967. It is suggested that the decrease in lung cancer mortality in these older men is due to poor diagnosis since most elderly patients prefer to die a "natural death" at home rather than be admitted to hospitals where sophisticated diagnostic methods are available. The increase in the lung cancer mortality between 1953 and 1967 is attributed to increased consumption of tobacco, increased air pollution, an increase in the population at risk, and improved diagnostic methods. The widespread use of antibiotics in treatment of respiratory infections has reduced the possibility of lung cancer being mistakenly diagnosed as pneumonia.

- 6882 HODGKIN'S DISEASE IN CHILDHOOD - AN EPIDEMIOLOGICAL STUDY IN NORTHERN GERMANY. (E.) Dörken, H. (I. Med. Clinic U. Hamburg, Germany) and H. Singer-Bakker. *Recent Results Cancer Res* 39:235-240, 1972.

An epidemiological study of Hodgkin's disease in Hamburg revealed a unique age distribution with two or three modes (the last peak occurring earlier in males than females), a more frequent manifestation of the disease during winter, and a greater number of affected persons coming from rural districts. A similar study of deaths in Northern Germany also revealed a unique age distribution but with nearly equal death rates from Hodgkin's disease among urban and rural dwellers. A further analysis of the age-specific mortality rates revealed a small but dis-

tinct prevalence among younger rural victims, but only among males. One hundred and twenty-five Northern German children with Hodgkin's disease were then studied; there were 86 deaths. The clinical picture (apart from certain special symptoms), the distribution of the affected lymph nodes, and the differential diagnosis among the children was the same as in the older age groups. The total estimated morbidity rate was 0.16/100,000/year. There were no cases of intra-familial cases recorded. Among most age groups, there was a clear preponderance of rural dwellers, this preponderance being more marked among males than females. There was no evidence of clustering.

- 6883 THE INCIDENCE OF CARCINOMA OF PROSTATE: AN EPIDEMIOLOGICAL SURVEY. (E.) Franks, L.M. (Dept. Cellular Path., Lincoln's Inn Fields, London, Great Britain). *Recent Results Cancer Res* 39:149-156, 1972.

Despite numerous sources of error regarding the evaluation of epidemiological data, there seem to be some obvious racial and geographical differences in the incidence of prostatic cancer. The incidence in the oriental races is greatly and consistently lower than in any other group; similarly, there is a remarkably high incidence rate among some groups of American Blacks and in New Zealand. In addition, there are a number of lesser variations, such as that between eastern and western Europe. The fact that these differences are often affected by migration among the different populations suggests that environmental factors may be important variables. The incidence of latent cancers is much higher than that of clinical cancers in all races. There is also a well-established age-associated variability in the incidence of prostatic cancer; there is a direct relationship between frequency of occurrence and age. It has been suggested that the initiation stage for prostatic cancer may occur commonly in all men in a population. The increasing frequency of cancer with age may be due to increased exposure to a hypothetical carcinogen or it may be a consequence of the process of aging. However, there is still no convincing evidence which explains the differences in incidence with age and race.

- 6884 LEUKEMIA AND THYROID CARCINOMA FOUND AMONG A-BOMB SURVIVORS IN HIROSHIMA. (E.) Watanabe, S. (Res. Inst. Nuclear Med. and Biol., Hiroshima U., Japan), Y. Shimamoto, T. Ohkita, H. Ezaki, T. Shigemitsu and N. Kamata. *Recent Results Cancer Res* 39:75-83, 1972.

The incidence of leukemia among survivors of the atomic bomb in Hiroshima over the past 25 yr was 7.54/100,000 population, compared to 4.07 for the general population. In particular, the chronic myeloid type of leukemia occurred more frequently among the survivors, particularly those who were within 2,000 meters of the explosion. The incidence of leukemia among people who entered Hiroshima within three days following the explosion was 8.99/100,000 population; the incidence of the

chronic myeloid form was also significantly increased among these people. It is hypothesized that the chronic form of radiation-induced leukemia may develop multicentrically from hyperplastic or maturation-arrested marrow after irradiation, whereas the acute form may originate unicentrically in intensely irradiated, hypoplastic marrow, with abrupt onset and rapid invasion. The incidence of chromosome abnormalities in the peripheral blood of the atomic bomb survivors was increased, especially among the older age groups. There were no unique abnormalities in the chromosomes of the bone marrow cells among healthy exposed individuals, and there were no differences in chromosome aberrations among normal and leukemic survivors. The incidence of thyroid carcinoma was about 10 times higher among survivors of the bomb, with the incidence increasing according to distance from the explosion. The first case of radiation-related thyroid carcinoma was detected 5 yr after the explosion, with the highest incidence being noted 16 to 20 yr after the explosion. Thyroid carcinoma developed more frequently among persons exposed to radiation when they were relatively young. The incidence of thyroid carcinoma was also greatly increased among persons who entered Hiroshima within three days after the explosion. In particular, the incidence of follicular carcinoma appears to have increased among those exposed to radiation. The status of thyroid carcinoma in Japan in general is discussed.

- 6885 DETECTION AND ASSESSMENT OF CASE CLUSTERING IN BURKITT'S LYMPHOMA AND HODGKIN'S DISEASE. (E.) Baikie, A. G. (Dept. Regius Professor Med., Oxford U., Great Britain), L. J. Kinlen and M. C. Pike. *Recent Results Cancer Res* 39:201-210, 1972.

The time, space, and time-space clustering of Burkitt's lymphoma (BL) and Hodgkin's disease (HD) are considered. BL is present in significant numbers only in tropical Africa and New Guinea, indicating that its etiology may involve malaria or a vector borne agent (apparently Epstein-Barr virus (EBV)). A weak negative association between the yearly total of BL cases and the yearly total rainfall in the West Nile district of Uganda has been observed, as has a marked decline in the number of cases of BL in the Mengo district between 1961 and 1968. Time-space clustering of BL has been demonstrated in both the West Nile district and Bwamba County of Uganda. While it appears that EBV is an important factor in the etiology of BL, this factor alone could not explain the observed clustering. Major differences have been found between countries in both the incidence and mortality from HD; these patterns may be related to economic status, but appear to have no relation to climatic differences. Among four groups of HD patients in Great Britain, Germany, and the United States, there was a definite excess of cases occurring in December and January. In contrast, an excess mortality from HD occurs among male children born in the U.S. between July and August. Several incidences of space-time clustering have been reported in New York state; all showed a preponderance of adolescent and young adult

cases. Further study of time-space clustering in HD would benefit from the use of two controls for each case of HD; one control would live near the index case, while the other would be chosen at random. A list of identifiable contacts could be obtained by means of loosely structured interviews. Several statistical tests for time-space clustering are discussed.

- 6886 PRIMARY INTESTINAL LYMPHOMA: CLINICAL MANIFESTATIONS AND POSSIBLE EFFECT OF ENVIRONMENTAL FACTORS. (E.) Ramot, B. (Chiam Sheba Med. Ctr., Tel-Hashomer, Israel) and A. Many. *Recent Results Cancer Res* 39:193-200, 1972.

In the Western world, primary intestinal lymphoma usually affects individuals over the age of 50, shows a male/female ratio of 1:3, and is intimately related to celiac sprue. In Israel, the disease is relatively common among Arabs and among Jews of Middle-Eastern and North African origin and is relatively rare in Jews of European origin. It affects primarily teenagers and young adults, shows a male/female ratio of 1.2:1, and does not occur concurrently with celiac sprue. In about 25% of Israeli cases, a diffuse plasma cell infiltration of the intestinal wall is observed; while various types of lymphoma are observed in the remainder of the cases, a plasma cell infiltration of the mucosa is generally present. A syndrome has been described which involves malabsorption, the histological features of plasma lymphocytic infiltration of the gut, and the presence of a fragment of heavy chain immunoglobulin; the existence of a heavy chain IgA has also been found in diffuse lymphomas without evidence of malabsorption. No clear evidence of a protein abnormality was detected in the family members of 10 patients with intestinal lymphoma and malabsorption; the IgA level in the Arab population was, however, higher than in the Jewish population of Israel. It is possible that chronic immunological stimulation of the gut by intestinal infestation leading to the development of intestinal lymphoma may be similar to the relationship between celiac sprue and intestinal lymphoma in the Western world. There is some evidence that anatomic or functional abnormalities in the lymphoreticular system may predispose to the development of intestinal lymphoma.

- 6887 SEROEPIDEMIOLOGICAL STUDIES ON CARCINOMA OF THE NASOPHARYNX. (E.) Lin, T. M. (Natl. Taiwan U. Coll. Med., Taipei), C. S. Yang, J. F. Chiou, S. M. Tu, C. C. Lin, C. H. Liu, K. P. Chen, Y. Ito, A. Kawamura and T. Hirayama. *Cancer Res* 33(11):2603-2608, 1973.

During a 1.5-yr retrospective study of nasopharyngeal carcinoma (NPC) in Taiwan, sera collected from NPC patients, age- and sex-matched neighborhood (N) controls, NPC families, and neighborhood control families were titrated for antibodies to herpes-type virus (HTV) in a Burkitt's lymphoma cell line (P3HR-1) by the indirect immunofluorescence antibody technique. Dissociations in the frequency distributions of antibody titers in the NPC and the

control groups were maximum when the limiting value was set at 1:640. Antibody titers were higher in the NPC patients than in any of the three control groups by geometric means and significantly different by riddit analysis. Of 321 NPC patients, 55% had anti-HTV antibody titers equal to or higher than 1:640. Such values occurred in only 6% of the three control groups. No sex difference in the percentages of "seropositive" cases in any group was evident. The distributions of anti-HTV antibody titers between cases of NPC and each of the three control groups were significantly different. The relative risks indicated that persons with an antibody titer equal to or higher than 1:640 had a NPC risk more than 40 times that of those with an antibody titer of less than 1:40. There were no significant differences in the geometric means and distributions of the anti-HTV antibody titers of the family members of the NPC patients and N controls by the same titer of probands. The geometric means of the anti-HTV antibody titers of the family members by different titers of probands, however, were higher for both groups; the titers were higher, and of the probands, the distributions were significantly different for both groups. There were no household aggregations of high titers of anti-HTV antibody in family members of either the NPC patients or the N controls.

- 6888 HISTOLOGICAL TYPES OF GASTRIC CANCER AND ITS RELATIONSHIP WITH INTESTINAL METAPLASIA. (E.) Munoz, N. (International Agency Res. Cancer, Lyon, France) and I. Matko. *Recent Results Cancer Res* 39:99-105, 1972.

Histological sections from surgical specimens or biopsies of gastric cancer cases from Colombia, Mexico, Poland, and Yugoslavia were classified into three groups: intestinal type, diffuse type, and those unassignable to either of the other two groups. In addition, to study the relationship between gastric cancer and intestinal metaplasia, 2771 gastric biopsies performed in Ljubljana were studied. The intestinal type cancers were most frequent in the high-risk (for gastric cancer) areas and among men and the older age groups. The diffuse type was most prevalent in the low-risk areas and among younger age groups; it showed no significant sex distribution. Reductions in the gastric cancer rates in the U.S. and Norway over the last decades have been due to a decrease in the intestinal type. The Ljubljana study indicated that patients with intestinal metaplasia have a higher risk of developing gastric cancer than the general population of Slovenia and a much higher risk than patients with gastric biopsies negative for intestinal metaplasia.

- 6889 PRIMARY CARCINOMAS OF THE LIVER IN HONG KONG: SOME POSSIBLE AETIOLOGICAL FACTORS. (E.) Gibson, J. B. (Dept. Path., U. Hong Kong) and W. C. Chan. *Recent Results Cancer Res* 39:107-118, 1972.

Although the incidence of primary liver-cell cancer differs greatly from one part of the world to another,

the etiology of liver cancer is probably the same throughout the world and racial factors are probably of relatively minor etiological importance. In most regions where liver cancer is highly prevalent, the vast majority of the tumors are of the hepatocellular form. Evidence indicates that the hyperplasia and metaplasia associated with oriental distomiasis are premalignant changes in the biliary system preceding intrahepatic-bile-duct carcinoma; how the liver fluke responsible for the former brings about its carcinogenic effect is unknown. Cholelithiasis may play a major part in the etiology of gall bladder cancer, but it seems to play no demonstrable role in the etiology of liver-cell carcinoma. While cirrhosis is present in 92% of Hong Kong cases dying with hepatocellular carcinoma, it appears that the two conditions may often develop together rather than sequentially. About 2.6% of all Hong Kong patients with liver carcinoma are positive for the Australia antigen. With regard to hepatotoxic elements in the environment, some naturally occurring biological products appear to be sources of chronic liver disease: pyrrolizidine alkaloids, the toxicogenic fungi *Penicillium islandicum* and *Aspergillus flavus*, and the nitrosamines. With the exception of *Penicillium*, all of these agents have shown evidence of being potential carcinogens in the human system.

- 6890 MALIGNANT NEOPLASMS IN THE CHECHEN-INGUSH AUTONOMOUS SOVIET SOCIALIST REPUBLIC. (Rus.) Khunkaev A. Z. (I. P. Pavlov 1st Leningrad Med. Inst., USSR). *Sovet Zdravookhr* (7):40-43, 1973.

Between 1961 and 1967 the incidence of cancer of in the Chechen-Ingush ASSR (Northern Caucasus) increased 19.4% from 137.1 to 163.9/100,000 inhabitants. Since the cancer mortality has decreased every year, some of this increase can be attributed to improvements in diagnosis and statistics and to an increase in the percentage of elderly inhabitants in the population. The most common form is skin cancer (29.6%) followed by cancers of the stomach (14.4%), cervix (9.2%), and lungs (8.7%). These four forms of cancer accounted for 61.9% of all malignant neoplasms. Men develop skin cancer less often than women, while men more commonly have cancer of the stomach, lungs, and liver. The indigenous population (Chechen and Ingush) has a higher incidence of cancers of the esophagus, larynx, lungs, prostate, leukemia, and sarcoma than Russians, while Russians have a higher incidence of cancers of the stomach, cervix, and skin. The incidence of malignant tumors is significantly higher in women (171/100,000) than in men (144.2/100,000, but these figures are about the same (139.6 and 144.2/100,000, resp.) when the values for cervical cancer are disregarded. Using values standardized for sex, the incidence of malignant tumors was 2.9 times higher in Grozny than in rural areas (297.2 compared to 102.3/100,000). When the data are standardized for age, the incidence of malignant tumors is 2.5 times higher for men and 3 times higher for women who reside in Grozny than for the rural population. These differences are most pronounced for cancers of the stomach, lungs, and cervix. The incidence of

malignant tumors increased with age. This was more marked among women than among men. The incidence of cancer was almost three times higher among Russians than among the Chechen and Ingush. Cancers of the skin (23.2%), stomach (17.6%), and lungs (11.1%) were the most common forms among blue-collar workers, while cancers of the skin (23.5%), cervix (14.1%), stomach (11.9%), and breast (11.9%) were the most common tumors in white-collar workers. Cancers of the lung, stomach, and skin occurred in the highest percentages among workers in petroleum refineries.

6891 TUMOURS OF LIVER, BILIARY SYSTEM AND PANCREAS. (E.) Hutt, M. S. R. (No affiliation) and P. P. Anthony. *Recent Results Cancer Res* 41:57-76, 1973.

An epidemiological survey of Uganda revealed 573 primary malignant tumors of the liver and biliary system: 528 cases of primary liver-cell carcinoma; 27 cases of bile duct carcinoma; 9 primary carcinomas of the gallbladder; 4 hepatoblastomas; and 5 primary intrahepatic malignant mesenchymal tumors. Combined, these tumors represented 7.9% of all malignant tumors seen, with an incidence of 2/100,000 population. The average age of the liver-cell carcinoma patient was 42.5 yr, with the diagnosis being made most frequently in the third and fourth decades of life. This tumor was seen with a male/female ratio of 3:1. Its pathology is discussed in terms of macroscopic and microscopic features. The sera of affected patients are frequently positive for alpha-fetoprotein (AFP) and a positive correlation between AFP and hepatitis-associated antigen has been observed in Ugandan patients with liver-cell carcinoma. The incidence of primary liver-cell cancer varies considerably with geography. Both cirrhosis and viral hepatitis have been associated with liver-cell carcinoma and there is a positive correlation between the amount of aflatoxin contamination of the food and the incidence of liver-cell carcinoma in some areas of Uganda. Intrahepatic bile duct carcinoma was seen in a male/female ratio of 1:2, while extrahepatic bile duct carcinoma was seen in a ratio of 1:1 and carcinoma of the gall bladder was seen in a ratio of 1:2.3. The pathology of the former is discussed, and brief discussions of hepatoblastoma and other embryonal tumors and hemangioendothelial sarcoma are included.

6892 EPIDEMICS OF HODGKIN'S DISEASE. (E.) Davies, J. N. P. (Albany Med. Coll., Union U., N.Y.). *Recent Results Cancer Res* 39:227-233, 1972.

Three epidemics of Hodgkin's disease involving a total of at least 85 people are discussed. In all of these situations, the disease developed in several members of a clique of young students who were closely associated over a period of years. The disease then developed in the students' non-clique associates and in their families; when the clique split up, subsidiary microepidemics occurred. Persons aged 14 to 74 yr were involved and all histological subtypes of Hodgkin's disease were seen.

Only two intra-familial cases were noted and almost invariably the disease seemed to spread from younger persons to older persons but not vice versa. In the community, the disease seemed to behave like an infective disease with a long incubation period; a resemblance to the epidemiologic features of leprosy was evident. Transmission was probably by the oral route and the disease seemed to be spread by case to case transmission or by case to contact (who remained in good health) to case transmission. Contact probably does not need to be prolonged for transmission to occur. No evidence of clustering in the usual sense of the word was found. The variety of histologic subtypes involved indicates different reactions to a single disease process.

6893 RECENT TECHNIQUES AND HYPOTHESES IN THE EPIDEMIOLOGY OF LIVER CANCER. (E.) Tuyns, A. J. (International Agency Res. Cancer, Lyon, France). *Recent Results Cancer Res* 39:119-124, 1972.

In light of the observed distribution of primary liver cancer throughout the world, viral hepatitis and food contamination by aflatoxin or other mycotoxins appear to be related to the etiology of the disease. Until recently epidemiological evidence of a causal relationship between these agents and human liver cancer was lacking due to an absence of useful investigative tools. However, new techniques have recently become available for detecting liver cancer, for measuring aflatoxin in food, and for detecting hepatitis associated antigen (H.A.A., chronic carriers of which seem to be at a greater risk of liver cancer) in the serum. Testing sera for the presence of alpha-fetoprotein can be used as a tool for diagnosing primary hepatoma and for measuring the frequency of the disease; this technique lends itself to use in field studies. It is now also possible to measure exposure to aflatoxin and to H.A.A. in population studies. Thus, adequate epidemiological investigation can be designed for testing the etiology of liver cancer in Africa. Several such studies have already been initiated by the International Agency for Research on Cancer in Africa and more are under preparation.

6894 MORTALITY AND MORBIDITY OF PROSTATIC CARCINOMA. (E.) Dhom, G. (Path. Inst., U. Saarlande, Homburg/Saar, Germany) and M. Hohbach. *Recent Results Cancer Res* 39:139-148, 1972.

While the morbidity and mortality from prostatic cancer vary significantly with geography and age, the factors which cause these extreme differences in incidence are unclear. In conducting a study of prostatic carcinomas, there are a number of obstacles encountered, many of which are not encountered when studying cancers of other localizations. While for most cancers, there is a correlation between the frequency of clinical, biopsy, and autopsy findings, prostatic carcinoma is found in series of routine autopsies eight times more frequently than would be expected from the mortality rate from prostatic carcinoma. This is due to a highly variable

degree of biologic malignancy, a variable which is seldom distinguished in epidemiological data. The mortality rate is also influenced by the autopsy rate. Further, the rate at which prostatic carcinoma is included in a biopsy specimen depends upon the methods employed: three times as many carcinomas are detected after needle biopsies as after the examination of TUR specimens. Thus countries such as Great Britain, in which many pathologists receive material from TURs and prostatectomies only, show low morbidity rates for prostatic cancer.

- 6895 HISTOLOGIC CLASSIFICATION AS A PROBLEM IN THE EPIDEMIOLOGY OF THYROID CANCER. (E.) Franssila, K. (Finnish Cancer Registry, Helsinki) and E. Saxen. *Recent Results Cancer Res* 39:47-55, 1972.

All of the cases (391) of thyroid cancer diagnosed in Finland between 1958 and 1962 were histologically reexamined and retyped. Thyroid carcinoma was classified into four histologic types: papillary, follicular, medullary, and anaplastic. On reexamination, 69% of the tumors were classified as thyroid cancer, with 16 being classified as suspected carcinoma. From this data an annual incidence rate of 1.22/100,000 population was derived; the original material prior to reexamination gave an incidence rate of 1.76/100,000 population. The distribution of the tumors according to histologic type was also different before and after reexamination; follicular carcinoma was the most common type prior to reexamination, while papillary carcinoma was the most common type afterwards. There were marked differences between the histologic types in terms of age of occurrence and incidence according to sex; in all types combined, the incidence among women was about twice that among men. The histologic subtypes also differed with regard to the frequency of inoperable tumors and regional and distant metastases, and relative survival rates. The data indicate that much information is lost if malignant tumors of one specific site are treated as a single group in epidemiologic studies.

- 6896 MIGRANT STUDIES IN ALIMENTARY TRACT CANCER. (E.) Staszewski, J. (Inst. Oncology, Gliwice, Poland). *Recent Results Cancer Res* 39:85-97, 1972.

Mortality rates from gastrointestinal cancer among Poles living in Poland, the United States, and Australia and native born white Americans were studied; data from the years 1950 through 1969 were utilized. In comparison with other countries, Poland is characterized by a high incidence of stomach cancer (which has recently started to decrease); the incidence is higher in the rural areas of the country than in the urban areas. On the other hand, the incidence of intestinal tract cancer is relatively low but increasing in Poland; the incidence is higher in the urban areas than the rural areas. The mortality rates from stomach cancer among Polish-born Americans resembled those in Poland rather than the low rates

among native-born white Americans; the same pattern was observed among Polish-born Australians. However, the incidence of intestinal tract cancer among the Polish immigrants in the United States and Australia resembled the high incidence rates in the host countries rather than the low rates in Poland. The data indicate that environmental rather than genetic factors are of primary importance in the development of stomach and intestinal cancers. The primary environmental factor influencing the development of stomach cancer may be the diet; a low quality diet causing alimentary deficiencies or the consumption of carcinogens in sour foods may lead to an increased risk of stomach cancer. Dietary factors which influence the intestinal bacterial flora and/or peristalsis may contribute to an increased risk of intestinal cancer.

- 6897 REGIONAL DISTRIBUTION OF BREAST CANCER: NEW CASES IN THE GERMAN DEMOCRATIC REPUBLIC BETWEEN JULY 1, 1968 AND JUNE 30, 1969. (Ger.) Möpert, S. (Med. Fac., Humboldt U., Berlin, Germany), K. Baldauf and G. Mildner. *Radiobiol Radiother (Berl)* 14(4):391-405, 1973.

Between 1955 and 1967, an increase of 156% occurred in the total number of cancer cases reported in the German Democratic Republic (DDR). Part of this increase is attributed to improvements in diagnosis and part to the increasing percentage of older women in the population. Statistics obtained in the DDR for 1960 and 1966 show that breast cancer accounts for about 1/7 of all cancer in women and for more than 1/5 of the cancer in women aged 45-49 yr. Between July 1, 1968 and June 30, 1969, 4032 new cases were reported (43.6 new cases/100,000 females in the population of the DDR). The incidence of breast cancer was highest in East Berlin (20% above the average), followed by the southern and southeastern regions of Dresden, Karl Marx Stadt and Leipzig. These are regions with the largest percentages of women over 40 yr old. The lowest incidence was in the north (Rostock, Schwerin, Neubrandenburg), southwest (Erfurt and Suhl) and in Cottbus. Depending upon the district, the mean age of patients with new cases of breast cancer ranged from 59.9 yr to 64.6 yr. Increases in the incidence of breast cancer in the Cottbus and Górlitz districts were about three times the national average. The lowest incidence of breast cancer was found in communities with populations of less than 500. In general, the incidence increased with the size of the community, except for communities with 3000-100,000 inhabitants which all had incidences of about 24.5/100,000. Part of the reason for the high incidence of breast cancer in large cities is better medical care since most of the cases were in the early stages when diagnosed.

- 6898 LYMPHORETICULAR NEOPLASMS. (E.) Wright, D. H. (No affiliation). *Recent Results Cancer Res* 41:270-291, 1973.

Study of the epidemiology of malignant lymphoma in Uganda is complicated by problems associated with diagnosis and classification. The incidence of lymphosarcoma and reticulum cell sarcoma together in

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Uganda is slightly less than in England and Wales up to the age of 50 yr, after which the rate in Uganda falls as the rate in Britain rises. The incidence of reticulum cell sarcomas is, however, higher in Uganda than in England and Wales; the proportion of nodular lymphomas among the Ugandans is relatively low. While the reported incidence of Hodgkin's disease in Uganda may be affected by under registration, it seems to be far lower than in England and Wales. However, the incidence of Hodgkin's disease among male Ugandan children under 15 yr is higher than among English and Welsh children; the incidence among Ugandan females of all ages is low. There is a relative excess among Ugandans of the mixed cellularity and lymphocyte depletion sub-types, with a corresponding decrease in the lymphocyte predominant and nodular sclerosis sub-types. Burkitt's lymphoma is the most common malignant lymphoma in Uganda, the highest incidence being seen in children aged 5 to 10 yr; the incidence varies widely throughout the country, a parallel existing between the incidence of Burkitt's lymphoma and the endemism of malaria. The incidence of plasmacytoma among Ugandans of all ages is low in comparison with England and Wales. The incidence of childhood leukemia among Ugandans appears to be low, although this may be due to underreporting.

6899 TUMOURS OF THE BRAIN. (E.) Templeton, A. C. (No affiliation). *Recent Results Cancer Res* 41:200-202, 1973.

While cerebral tumors are infrequently diagnosed among Ugandans, it is likely that a considerable portion of the tumors which occur are not registered or diagnosed. Thus the incidence may be similar to that seen elsewhere. Among 26 malignant tumors recently diagnosed among Ugandans, 16 were astrocytomas, two were meningiomas, and there was one each of the following: cerebellar hemangioblastoma, pinealoma, microglioma, malignant melanoma, and malignant glioma of the spinal cord. Three medulloblastomas and three meningiomas of the spinal canal were also seen. In general, the patients were in the first three decades of life. Two patients developed symptoms of an intracranial space-occupying lesion as a result of metastatic deposits; secondary tumors of the brain are uncommon in Uganda. Extension of lymphoma or leukemia to involve the nerve roots or meninges represents the most common tumor of the intracranial cavity in Uganda.

6900 LEUKAEMIA. (E.) Templeton, A. C. (No affiliation). *Recent Results Cancer Res* 41:298-301, 1973.

Between 1964 and 1968, 200 cases of leukemia were registered in Uganda; leukemia represented 2.7% of all registered cancers. There were 83 cases among females and 114 cases among males. Due to the failure of many Ugandans to seek medical attention and a high rate of underdiagnosis, there was a considerable underestimation of the true frequency of leukemia among Ugandans; the true frequency may be about 4 times higher than the registered figures indicate.

While the registry data indicates that the incidence of childhood leukemia is lower in Uganda than in other countries, this probably also represents a considerable underestimation; thus childhood leukemia is probably not significantly less common among Ugandans. In Europe, acute lymphatic leukemia is considerably more common than the myeloid forms, whereas in Uganda, acute myeloid leukemia accounted for 56% of childhood leukemias. Acute myeloid and lymphatic leukemia appeared with equal frequency in all areas except in northern Uganda, where there was an excess of the myeloid types. Burkitt's lymphoma is most common in northern Uganda. The incidence of leukemia among adults was similar to that reported elsewhere except that the mean age at presentation was younger in Uganda than in many countries.

6901 DOWN'S SYNDROME AS AN EXAMPLE OF A HIGH-RISK GROUP IN LEUKEMIA. (E.) Kobayashi, N. (Faculty Med., U. Tokyo, Japan). *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 329-335, 1973.

Children with Down's syndrome are at 20 times greater risk of developing leukemia than are healthy children. Trisomy may be the most important factor for the increased risk of leukemia in Down's syndrome, although there is no direct evidence for this. The lymphocytes of Down's syndrome patients show an abnormality in phytohemagglutinin (PHA)-lymphocytic blastogenesis *in vitro*; the Down's syndrome lymphocytes are hypersensitive to the influence of PHA. Enhanced risk of leukemia in Down's syndrome may also be related to the premature senility and shortened life span shown by affected individuals. Down's syndrome is also characterized by dysgammaglobulinemia, large and cystic Hassall's corpuscles with increased reticular activity in the thymus, and a high incidence of the Australia antigen, thyroid antibody and Epstein-Barr virus antibody. While the frequency of chromosome breakage does not differ between normal children and children with Down's syndrome, the frequency of breakage is almost three times higher in Down's syndrome patients who have had measles than in normal children who have had measles.

6902 PERSONS AT EXCEPTIONALLY HIGH RISK FOR CANCER FOLLOWING A-BOMB EXPOSURE. (E.) Kato, H. (Japanese Natl. Inst. Hlth., Hiroshima). *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 287-295, 1973.

A long-term cohort type study of atom bomb survivors in Japan has provided data relating to the identification of exposed persons at exceptionally high risk of developing cancer. Persons exposed to 200 rad or greater during the explosion are at higher risk of developing leukemia than are controls, and those exposed to 100 rad or greater are at higher risk of developing malignancies other than leukemia. The relative risk of developing nonleukemic malignancies is higher among younger people, particularly those aged less than 10 yr at the time of the bombing (ATB); the relative risk of developing

leukemia is higher among those aged less than 20 yr and those aged more than 50 yr ATB. The risk of thyroid and breast cancer is also higher among people exposed at young ages. The frequency of thyroid cancer is higher in females than males, as is the risk of silent thyroid cancer among those exposed to 50 rad or more. Children exposed to the explosion *in utero* suffered a temporary suppression of influenza antibody production. The risk of lung cancer, particularly the small-cell anaplastic type, is elevated among the high dose group; there is no interaction between the radiation effects and the effects of smoking. No relation has been found between mortality due to cancer and exposure dose among *in utero* exposed children.

6903 TUMOURS OF BONE AND JAW. (E.) Dodge, O. G. (No affiliation). *Recent Results Cancer Res* 41:222-233, 1973.

Of 211 tumors of the skeleton registered in Uganda between 1964 and 1968, there were 47 cases of osteogenic sarcoma. Rapid growth and mechanical stress appear to be important factors in the localization and age distribution of bone sarcoma. The tribal distribution and histological features of this tumor are discussed. There was, in addition, 1 case of parosteal sarcoma, 13 cases of chondrosarcoma (more than half of which occurred in the second decade of life), 6 cases of giant-cell tumors of the bone, 4 examples of chordoma, 15 round-cell tumors of the bone, 7 cases of synovial sarcoma, and 57 cases of malignant neoplasms metastatic to bone. While Ewing's sarcoma is the second most frequent primary bone tumor in U.S. white children, it is almost nonexistent among Ugandan children. There may be a reciprocal relationship between Ewing's tumor and myeloid sarcoma. Also registered between 1964 and 1968 were 35 odontogenic tumors, of which 32 were ameloblastomas. Most of the ameloblastomas occurred in the fourth decade of life. The apparently high frequency of this type of tumor in Uganda (and Africa in general) may simply represent a statistical artifact occurring during the early years of the epidemiologic exploration of the incidence of tumors among these people. Other odontogenic tumors consisted of one case of Pindborg tumor, one case of intra-alveolar clear cell epidermoid carcinoma, and one case labelled as a tumor of parodontal residues. Benign bone tumors were well represented in the Ugandan series.

6904 TUMOURS OF ENDOCRINE GLANDS. (E.) Templeton, A. C. (No affiliation). *Recent Results Cancer Res* 41:215-221, 1973.

Between 1964 and 1968, nine pituitary tumors, four craniopharyngiomas and five adenomas were registered in Uganda; because of underdiagnosis, it is likely that the actual incidence rate is higher. Three of the craniopharyngiomas occurred among children, while all of the adenomas occurred in adults. Secondary involvement of the pituitary by other neoplasms was rare. Adenoma of the thyroid was diagnosed in 52 females and six males; these tumors were seldom associated with carcinoma. There

were 82 cases of carcinoma of the thyroid, showing an incidence rate of 1.6 per 100,000 population among females and 0.8 among males; the incidence is similar to that in other countries. The data do not support a definite relationship between cancer, adenoma, and goiter. Follicular carcinomas were the most frequently encountered thyroid tumors, and there were two medullary carcinomas and 10 undifferentiated tumors. Involvement of the thyroid in Burkitt's tumor was seen occasionally. No thyroid cases were seen among children and only 22% occurred among persons under 30 yr. The age and histological distributions were essentially similar in males and females. There were no parathyroid tumors, two adrenal cortical carcinomas, three adrenal medullary tumors, two islet cell tumors, and four cases of thymoma, involving three epithelial tumors. None of the latter patients showed evidence of myasthenia.

6905 IMMUNOGENETIC STUDIES OF SOUTHEAST ASIAN ETHNIC GROUPS WITH HIGH AND LOW-RISK FOR NASOPHARYNGEAL CARCINOMA. (E.) Simons, M. J. (WHO Immunol. Res. Training Ctr. U. Singapore), S. B. Kwa, N. E. Day, G. B. Wee, B. R. Hawkins, G. B. de The and K. Shanmugaratnam. *Proc Third Int Symposium Princess Takamatsu Cancer Res Fund, Japan* 171-193, 1973.

Specific incidence and circumstantial data support the hypothesis of a genetic predisposition to the development of nasopharyngeal carcinoma (NPC). Numerous nasopharyngeal and nonnasopharyngeal mechanisms might be involved in a genetic predisposition to the development of NPC. There is evidence that Epstein-Barr virus (EBV) has a special or even etiologic role in the development of NPC. According to a working immunological hypothesis, where the environmental load of pathogenic microorganisms is heavy and where initial exposure occurs during postnatal and early childhood life, cell-mediated immunity (cmi) may be functionally depressed to a varying degree and for varying periods of time. When the infectious process directly involves lymphocytes, these periods of functional deficiency will be prolonged. At these times there is a higher probability that continuing infection will result from exposure to those agents whose elimination requires cmi. Methodological considerations involved in testing such an hypothesis are discussed, with special emphasis in blood immunogenetic studies.

6906 TUMOURS OF THE BREAST. (E.) Templeton, A. C. (No affiliation). *Recent Results Cancer Res* 41:94-100, 1973.

Cancer of the breast is the second most frequently encountered malignancy among Ugandan women, although its incidence among European women is about five times greater than among Ugandan women. Part of the difference may be due to the reluctance of Ugandan women to seek medical attention for breast lesions. Fibroadenoma among Ugandan women is also less common than among European women; the histological appearance of the tumors and the age distribution are

similar. Adenocarcinoma is the most common malignant breast tumor in Uganda, with Burkitt's tumor being the second most frequent; soft tissue sarcomas are frequently seen, while tumors of the skin of the breast are rare. The incidence rate of breast cancer is similar throughout Uganda, with few tribal differences existing. Although breast cancer is encountered as frequently among Ugandan males as among European males, the male/female incidence ratio is higher in Uganda. All of the histological types of tumor found in females are found among Ugandan males and in roughly the same proportion. The mean age of tumor occurrence is higher in Ugandan males than in Ugandan females. In general, Ugandan females seek medical attention later in the course of malignant disease than do European women.

- 6907 MELANOMA. (E.) Lewis, M. G. (No affiliation). *Recent Results Cancer Res* 41:171-179, 1973.

Between 1964 and 1968, 195 cases of malignant melanoma were registered in Uganda. Melanomas accounted for 2.7% of all malignant tumors registered during this period, thus showing a similar incidence rate as in other countries. The age-specific incidence curve showed only a slow rise, and, while the numbers of female and male cases were nearly equal, it appears that the disease is more common among females in several tribes. The geographical distribution of malignant melanoma was varied. The majority of the tumors arose on the foot and on other nonpigmented areas; in Africans, it is extremely rare for malignant melanoma to arise in pigmented skin. Metastatic spread to involve local lymph nodes was common and occurred relatively early. Nevi were common, with the close correlation between nevi and malignant melanomas of the foot indicating that most such tumors arose in preexisting junctional nevi. The etiology of malignant melanoma is uncertain, but there is no clear-cut relationship between depth of pigmentation and the incidence of melanoma.

- 6908 BRONCHOGENIC CARCINOMA IN KASHMIR VALLEY. (E.) Nafae, A. (Government Med. Coll., Srinagar, India), S. P. Misra, S. N. Dhar and S. N. A. Shah. *Indian J Chest Dis* 15(4):285-295, 1973.

Twenty-five cases of bronchogenic carcinoma in Kashmir Valley, India, were examined using 'deep-cough' samples, bronchoscopy, and biopsy specimens. All of the patients were males between 40 and 80 yr of age. Although there were no definite relationships between occupation and lung cancer, five of the patients were engaged in trades involving prolonged exposure to wool fibers. The site of malignancy was most often in the upper lobes of the lung, the left upper lobe being involved most often; the two lungs were involved equally frequently. Bronchoscopy indicated the presence of neoplasm in 76% of the cases; biopsy specimens suitable for histologic examination were obtained in all cases showing growth on bronchoscopy. Cytologic ex-

amination of the sputum provided positive evidence of malignancy in 72% of the cases. Histologically, the squamous variety accounted for 56% of the tumors, the oat-cell variety accounted for 20%, adenocarcinomas accounted for 12%, and the anaplastic cell type accounted for 12%. Eighty-eight percent of the patients were smokers, 2 patients being cigarette smokers, and 20 being *hukkah* smokers.

- 6909 EPIDEMIOLOGICAL ASPECT OF AN OUTBREAK OF LEUKEMIA IN A COLONY OF BABOONS (*Papio hamadryas*) IN THE SUKHUMI ANIMAL FARM. (Rus.) Lapin, B. A. (Inst. Exp. Pathol. Ther., Sukhumi, USSR), L. A. Iakovleva, N. S. Asanov, L. V. Kokosha, G. S. Tsiripova, N. B. Mirvis and M. T. Ivanov. *Vopr Virusol* (1):38-45, 1973.

Although not one case of "spontaneous" leukemia had occurred in 40 yr in the colony of baboons (*Papio hamadryas*) kept at the Sukhumi Animal Farm, 30 animals died with clinical and morphological signs of leukemia between the end of 1967 through March 1972. Almost all of the baboons who died were over 5 yr old and 23 of the 30 were females, which is a larger percentage than would be expected from the sex ratio in the colony (255 females and 205 males). Of these 30 baboons, 18 had come into direct contact with one or more baboons which had been inoculated with material from human leukemia patients in 1966; the remaining 12 baboons came into contact with animals who developed "spontaneous" leukemia. The incubation period varied from a few months to 2-3 yr. Splenomegaly and generalized lymph node hyperplasia were associated with proliferation of immature cells, primarily of the reticular series, in the lungs, kidneys, bone marrow, liver and, to a lesser extent, other organs. Symptoms of a leukemia-like disease were observed in 28 of 81 baboons, aged 1-4 yr, which were inoculated with material from 10 baboons who had died of leukemia; none of these younger animals died. A third passage of material produced a leukemia-like disease in 2 of 4 baboons, aged 5-15 yr; 1 baboon died with clinical and morphological signs of severe leukemia. Electron microscope examination of material from baboons who died of leukemia revealed the presence of C type particles. A specific surface antigen was demonstrated in WBC from baboons who died of leukemia and those inoculated with material from these baboons by using the indirect immunofluorescence method with heterologous antisera against the blood of human leukemia patients. Symptoms of a leukemia-like disease also induced in 3 of 6 monkeys by inoculating them with sediment from urine obtained from baboons with "spontaneous" leukemia.

- 6910 GROUP CHARACTERISTICS OF CHILDREN WITH CEREBRAL AND SPINAL CORD TUMOURS. (E.) Stewart, A. M. (Dept. Social Med., U. Oxford, Great Britain), E. L. Lennox and B. M. Sanders. *Br J Cancer* 28(6):568-574, 1973.

The group characteristics of 2072 English, Scottish, and Welsh children who developed intracranial or spinal cord tumors before the age of 15 yr were

studied. These tumors were more common in males than in females and the prognoses among the females were better than among the males. The risk of death in both sexes was negatively correlated with the age at diagnosis, while the risk of a late death was positively correlated with the age at diagnosis. About 45% of the tumors originated in the cerebellum, 14% originated in the cerebral hemispheres, 9% originated in the midbrain, and 7% originated in the pons. The cerebellar tumors tended to occur in younger children and were 42 times more frequent among females than males. The survival rate was relatively higher among children with cerebral tumors, which tended to occur at a later age. The data suggest that most of the brain tumors occurring in children are of an embryonic origin.

- 6911 THE HEALTH OF ATOMIC BOMB SURVIVORS: A DECADE OF EXAMINATIONS IN A FIXED POPULATION. (E.) Belsky, J. L. (Dept. Med., Atomic Bomb Casualty Comm., Hiroshima, Japan), K. Tachikawa and S. Jablon. *Yale J Biol Med* 46(4):284-296, 1973.

The effects of sublethal whole-body irradiation were studied in persons who were within 2000 m of the atomic bomb explosions in Hiroshima and Nagasaki. The data on these people was compared to that from people who were not present within these two cities during the explosions and people who were in the environs but at distances where there was little or no radiation. With regard to specific disorders, only thyroid hyperplasia appeared to be significantly more prevalent among the A-bomb survivors. However, people who were heavily irradiated in childhood were significantly shorter in stature as adults. Further, the mortality rate seems to be increasing among heavily exposed persons; this seems to be associated with deaths due to cancer other than leukemia. It is hypothesized, but not experimentally proven, that the A-bomb survivors have aged more quickly than their nonirradiated counterparts. Similarly, although there is some evidence that exposed persons have experienced more nonspecific psychologic and sociologic symptoms than nonexposed persons, there is no clear evidence of a significantly affected life pattern. Chromosome alterations consisting of dicentric, ring forms, and breaks were increased in heavily exposed survivors.

- 6912 CANCER, LEUKAEMIA, CONGENITAL ABNORMALITIES AND DOWN'S SYNDROME IN VICTORIA, AUSTRALIA. (E.) Stoller, A. (Inst. Mental Res. Post-Grad. Training, Children's Cottages, Kew, Australia), C. Judge, J. Krupinski and L. Wallace. *J Ment Defic Res* 17(3):263-271, 1973.

Two surveys were conducted in Victoria, Australia to determine a possible association between Down's syndrome and congenital abnormalities and/or malignancies. The incidence of congenital anomalies in the extended families of subjects with Down's syndrome was no greater than the incidence in the general population. Similarly, the age specific cancer rate of grandparents and mothers of Down's syndrome subjects was no greater than expected from the rate in the

general population. Thus, the data do not suggest congenital constitutional differences specifically associated with the development of 21-trisomy.

- 6913 THE CELL KINETICS OF DIFFERENT TYPES OF HUMAN TUMOURS. (Fr.) Malaise, E.-P. (Radiobiol. Clin., Inst. Gustave-Roussy, Villejuif, Fr.), N. Chavandra, F. Battaglini, J.-M. Richard and M. Tubiana. *Bull Cancer* 60(2):119-130, 1973.
- 6914 STUDIES ON THE DIVISION CYCLE OF MAMMALIAN CELLS. VII. X-RAY SENSITIVITY AND REPAIR CAPACITY OF SYNCHRONOUSLY DIVIDING MURINE MASTOCYTOMA CELLS. (E.) Schaer, J. C. (Allegheny Gen. Hosp., Pittsburgh, Pa.) and L. Ramseier. *Radiat Res* 56(2):258-270, 1973.
- 6915 EPIDEMIOLOGY OF LEUKEMIA IN KRAKOW FROM 1961 TO 1968. I. GENERAL CHARACTERISTICS OF ITS MORBIDITY. (Pol.) Sliwczynska, B. (Acad. Med., Krakow, Poland). *Przegl Lek* 30(6):500-504, 1973.
- 6916 DOUBLE PULSE LABELLING WITH ³H-THYMIDINE: A METHOD FOR CALCULATING CELL POPULATION KINETICS. (E.) Sharav, Y. (Sch. Dental Med., Hadassah Hebrew U., Jerusalem, Israel), I. Brin-Erb and I. Sciaky. *Cell Tissue Kinet* 6(16):527-534, 1973.
- 6917 A MATHEMATICAL MODEL OF PROLIFERATING CELL POPULATIONS: FURTHER DEVELOPMENT AND CONSIDERATION OF THE RESTING STATE. (E.) Fried, J. (Div. Biophys., Sloan-Kettering Inst. Cancer Res., New York City, N.Y.). *Math Biosci* 18(3-4):397-408, 1973.
- 6918 CANCER REGISTRY IN THE FEDERAL REPUBLIC OF GERMANY: REPORT ON THE ESTABLISHMENT AND OPERATION OF MODEL PROJECTS IN HAMBURG AND THE SAARLAND. (Ger.) Gotz, J. (German Cancer Res. Ctr., Heidelberg, Germany), B. Huttel, G. Keding, T. Kramer, E. Leutheusser, W. Matti and G. Wagner. *Dtsch Med Wochenschr* 98(50):2411-2417, 1973.
- 6919 CORRELATIONS IN THE CONTENT OF FIBRINOGEN AND CORTICOSTEROIDS IN THE BLOOD OF PATIENTS WITH MALIGNANT TUMOURS. (Rus.) Negrei, L. N. (Kiev Med. Inst., USSR) and E. B. Sopotsinskaya. *Vrach Delo* (11):64-66, 1973.
- 6920 NATURAL HISTORY OF MALIGNANT LYMPHOMAS. (Jap.) Wakasa, H. (Dept. Pathol., Tohoku U. Sch. Med., Japan). *Jap J Cancer Clin* 19(5):387-394, 1973.

6921 ESTABLISHMENT OF A CANCER REGISTRATION
SYSTEM IN INDIA. (E.) Jussawalla, D. J.
(No affiliation). *Indian J Cancer* 10(2):125-127,
1973.

6922 FREQUENCY OF CHORIONEPITHELIOMA. (Rus.)
Draca, P. (Clin. Hosp., Novi Sad, USSR).
Srp Ark Celok Lek 100(9):1065-1069, 1972.

See also:

* (Rev): 6607, 6612, 6617, 6632, 6641, 6644,
6660
* (Chem): 6673, 6622

- 6923 STUDY OF RIBONUCLEASE POLYMORPHISM IN EXPERIMENTAL LEUKEMIA. (Rus.) Shliak-hovenko, V. A. (Inst. Problems Oncol., Kiev, USSR). *Vestn Akad Med Nauk SSSR* (7):80-85, 1973.

Ribonuclease activity was significantly lower in cells of transplantable Svec rat leukemia than in bone marrow cells or peripheral WBC from normal adult Wistar rats. Polyacrylamide electrophoresis revealed that most ribonuclease activity was concentrated in the cytoplasm. No differences were found in the five isoenzyme components in native preparations of these three types of cells. Except for fraction 5, which either contained nonspecific nuclease or was not completely specific, none of these ribonuclease fractions had any effect on DNA. The pH maximum for all isoenzymes was 5.8-6.2, and heating to 90 C for 5-15 min had no effect on their activity. The activity of all ribonuclease fractions was completely inhibited by incubating with $2 \times 10^{-3}M$ copper acetate in 0.1M acetate buffer (pH 5.5) for 15-60 min at 0-4 C, but treatment with $1 \times 10^{-2}M$ sodium salt of ethylenediamine tetraacetic acid for 60 min at 0-4 C completely restored enzyme activity in all fractions. The activity of nuclear ribonuclease was significantly higher in leukemic cells than in normal bone marrow. The number and activity of ribonuclease fractions decreased as cells matured in normal peripheral WBC, while in leukemic cells the ribonuclease activity in the nuclei increased during malignant transformation. The isoenzyme pattern in nuclei of Rauscher's leukemia and NK/Ly lymphoid leukemia cells was similar to that found in transplantable Svec leukemia cells. The most characteristic change in nuclear ribonuclease in all leukemic cells was a marked increase in enzyme activity in fractions corresponding to histone component F₁.

- 6924 CHOLANGIOCARCINOMA WITH HYPERCALCEMIA - A CASE REPORT STUDIED BY ELECTRON-MICROSCOPE AND RADIOIMMUNOASSAY. (E.) Kihara, I. (Niigata U. Sch. Med., Japan), T. Suzuki, H. Takamiya and S. Hirono. *Acta Pathol Jap* 23(4):791-804, 1973.

A 63 yr old female presented with a tumor of the intrahepatic bile duct associated with hypercalcemia in which immunologically reactive parathyroid hormone was demonstrated. Tumor cells contained electron-dense granules comparable to those of the secretory granules in some endocrine cells of the alimentary tract. Four small parathyroid glands with a combined wt of 66 mg were identified. An extensive search for ectopic parathyroid gland failed. Elevated serum calcium levels and alkaline phosphatase responded well to prednisolone, 30 mg/day and mitomycin, 2 mg, plus 5FU, 250 mg 3 times/wk. The patient entered a temporary remission for three months at which time the serum calcium again was elevated and did not respond to prednisolone and various chemotherapeutic drugs. A review of the literature cases in which the parathyroid hormone-like properties were immunochemically analyzed and the parathyroid glands histologically examined prompted the suggestion that long-term

hypercalcemia and over-production of parathyroid hormone-like properties from the tumor do not suppress the parathyroid glands *per se*. In this case the fatty involution of the parathyroid glands was minimal, about 1/10 of the parenchyma. It is suggested that tumors of this type have an ability to produce some polypeptide substances. These findings suggest that the tumor may have produced a parathyroid hormone-like property and is the primary cause of hypercalcemia in this patient.

- 6925 MORPHOLOGY AND GROWTH, TUMORIGENICITY, AND CYTOGENETICS OF HUMAN NEUROBLASTOMA CELLS IN CONTINUOUS CULTURE. (E.) Biedler, J. L. (Mem. Sloan-Kettering Cancer Ctr., New York, N.Y.), L. Nelson and B. A. Spengler. *Cancer Res* 33(11):2643-2652, 1973.

Continuous cell lines (SK-N-SH and SK-N-MC) were established in cell culture from human metastatic neuroblastoma tissue and maintained *in vitro* for 1 to 2 yr. SK-N-SH comprises two morphologically distinctive cell types, a small spiny cell and a large epithelioid cell. SK-N-MC is composed of small fibroblast-like cells with scant cytoplasm. In monolayer culture both cell lines form disoriented growth patterns and reach high saturation densities. Population-doubling times were 44 and 32 hr for SK-N-SH and SK-N-MC, respectively. Inoculum levels of 10^7 cells of both lines produced tumors confirmed by histopathological examination, at frequencies of 30 to 40% in cheek pouches of conditioned Syrian hamsters. SK-N-SH cells are characterized by high dopamine- β -hydroxylase activity while SK-N-MC cells have no detectable activity. However, for SK-N-MC but not SK-N-SH, the presence of intracellular catecholamine was indicated by formaldehyde-induced fluorescence. The lines are near-diploid with several chromosomal markers; SK-N-MC cells contain double-minute chromosomes. Growth, biochemical, and cytogenetic properties confirmed that the lines comprise malignant cells of neurogenic origin.

- 6926 HUMAN LEUKEMIC CELLS: BIOLOGICAL ACTION OF EXOGENOUS HUMAN LEUKEMIC DNA. (E.) Desai, L. S. (Children's Cancer Res. Fdn., Boston, Mass.), J. L. Cohen and G. E. Foley. *Biochimie* 55(11-12):1461-1468, 1973.

Intact exogenous human leukemic DNA derived from cells in culture was taken up by normal and leukemic recipient human cells. It migrated to the nucleus and became associated with host genome. Uptake of exogenous DNA averaged 15-20% and was relatively higher in leukemic than normal cells in a given culture medium. Isologous and homologous human leukemic cells were more sensitive to inhibition by this exogenous DNA than normal human cells. Synthesis of both DNA and RNA was inhibited, but protein synthesis was stimulated. Immunological studies of hamster cells treated with human leukemic DNA did not show human surface antigens. The *in vivo* studies showed that this metabolically active radioactive DNA migrated to several organs of hamsters and

gerbils, with the highest labeled DNA activity occurring in the testis and kidney. Prolonged exposure to exogenous leukemic DNA caused marked phenotypic changes in normal human fibroblasts, which appear heritable. Genotypic changes in these altered cells may relate these observations to neoplastic transformation.

- 6927 CYTOGENETIC STUDY OF ERYTHROMYELOSIS AND ERYTHROLEUKAEMIA. (E.) Demin, A. A. (Novosibirsk Med. Inst., Leipzig, Germany), M. M. Degtjareva, N. V. Metelkina, S. I. Radgabri and V. A. Kabardina. *Folia Haematol (Leipz)* 100(4):401-416, 1973.

Chromosome patterns were studied in 15 patients (8 males and 7 females, aged 16-69 yr), of whom 5 had acute or subacute erythromyelosis and 10 had acute or subacute erythroleukemia. It was concluded that 50% of the cases had marked abnormalities in chromosome counts (hypodiploidy, hyperdiploidy, polyploidy) and structure (marker chromosomes, fragments, microchromosomes, ring chromosomes), indicating marked genetic variability of bone marrow cells. The finding in many polyploid cells of structural abnormalities similar to those of hypodiploid cells suggests that they may be forerunners of polyploid cells. The results of the study indicate a lack of specific chromosome abnormalities in erythroleukemia. There was some correlation between the severity of the condition and the degree of chromosome abnormality. In eight patients with marked abnormalities, seven suffered from a more severe course of the disease and were completely resistant to cytostatic therapy. Of these seven, three had marker chromosomes. In some cases with the most malignant course of disease, the genetic heterogeneity of bone marrow cells made possible more effective selection of cells which dominate in malignant progression. Complete absence of normal diploid cells was noted in these cases. Hypodiploid chromosome counts found in erythromyelosis and erythroleukemia suggest a relation of these conditions to acute myeloblastic leukemia, in which similar abnormalities are found. Chromosome abnormalities demonstrated in the majority of metaphase plates of patients with erythromyelosis and erythroleukemia suggest that in such conditions both erythroid and myeloid elements suffer from malignant transformation.

- 6928 ISOLATION AND PARTIAL CHARACTERIZATION OF GLYCOPROTEINS POSSESSING STRONG INHIBITORY ACTIVITY AGAINST VARIOUS MITOGENS FROM HUMAN LYMPHOCYTES. (E.) Ide, H. (Fac. Pharmaceutical Sci., U. Tokyo, Japan), S. Toyoshima, T. Terao and T. Osawa. *Jap J Exp Med* 43(6):533-543, 1973.

Glycoproteins with potent inhibitory activity against various mitogens have been isolated from defatted human lymphocytes by trypsin digestion followed by gel filtration and DEAE-Sephadex column chromatography. Of the four glycoproteins thus isolated, Fractions 1-B, 1-C, 1-D, and 1-E, 1-D and 1-E contained remarkable amounts of DNA (44.5% and 32.6%, resp., the entire nucleic acid content of each) and

strongly inhibited the mitogenic activities of *Phaseolus vulgaris* hemagglutinin, concanavalin A and anti-human lymphocyte horse serum (ALS). The other two were potent inhibitors only against the phyto-mitogens but were devoid of inhibitory activity against ALS. The DNA in the former glycoproteins could be removed by snake venom phosphodiesterase without affecting the inhibitory activity. The amino acid composition of the active fractions showed that 1-B and 1-C were rich in acidic and hydroxy amino acids and glycine, and low in sulfur-containing amino acids. Fractions 1-D and 1-E were remarkably rich in glycine and low in sulfur-containing amino acids and proline. These fractions contained 1-3% carbohydrates of which hexosamine and galactose were the predominant sugars. An appreciable amount of glucose was present and only a trace amount of sialic acid. Glycolipids were not detected. An approximate molecular wt of 400,000 was calculated on Fraction 1-C. Despite the low carbohydrate content of these glycoproteins, their inhibitory activities against the mitogens are remarkably higher than that of trypsin fragment from human erythrocytes. This strongly suggests that the protein moiety of the glycoproteins also affects the inhibitory activities against various mitogens.

- 6929 CANCER OF THE COLON IN FOUR MEMBERS OF ONE FAMILY. (Rus.) Christikhin, V. S. (No affiliation) and T. L. Zvezdina. *Vopr Onkol* 19(12):79-80, 1973.

Cancer of the colon developed in four brothers in one family. The family consisted of two sisters and six brothers who all lived in rural Latvia. The father had died of stomach cancer at age 53 yr, but there was said to be no history of cancer in previous generations. The youngest brother underwent surgery for removal of an adenocarcinoma of the ascending colon at age 33; he has since received three courses of 5-fluorouracil and "ftorafur". At age 38 yr, an older brother was found to have a rectosigmoid cancer which had invaded the stomach and metastasized into the liver. The tumor could not be removed, and the patient was given palliative therapy with "ftorafur" (30 g). The third brother had a rectal adenocarcinoma removed at age 33 yr and later received 12,000 r telegammatherapy; he is alive and well 11 yr later. The fourth brother had an adenocarcinoma removed from the descending colon at age 45.

- 6930 ULTRASTRUCTURE OF RETICULUM CELL SARCOMA. (E.) Hoshino, M. (Aichi Cancer Ctr. Res. Inst., Nagoya, Japan). *Gann Monograph on Cancer Res* 15:83-95, 1973.

The ultrastructure of the reticulum cell sarcoma was examined in 35 cases of various histological types of this sarcoma. The reticulum cell sarcoma shows a wide range of variation in ultrastructure and histology. The original sites of these 35 reticulum cell sarcomas included the lymph nodes (31 cases), s.c. tissue (3), and bone marrow (1). Histological clas-

sification of the 31 lymphatic reticulum cell sarcomas included 12 of the undifferentiated and 19 of the differentiated types. For practical diagnosis, it is essential to note the relationship between the tumor cells and reticulum fibers, the characteristic cell arrangement, and the elongated cell processes at the ultrastructural level. It is concluded from this study that cells of reticulum cell sarcoma of the differentiated type 1 classified from their histology usually have differentiated cytoplasmic ultrastructures.

- 6931 ULTRAMORPHOLOGICAL FEATURES OF AN EXPERIMENTAL HAMSTER SARCOMA. (E.) Klein-Szanto, A. J. P. (Natl. Comm. Atomic Energy, Buenos Aires, Argentina), C. J. Conti and J. Mayo. *Z Krebsforsch* 80(4):277-284, 1973.

Cells from an experimental sarcoma produced by inoculation of BHK 21 cells clone 13 cells in hamsters showed many similar ultrastructural features with the original cultured cells. Some cells were necrotic. Clear and dark cells with different proportions of organelles in their cytoplasm, probably representing different metabolic stages of the same tumor cell, were noted. The cells contained abundant free ribosomes or polyribosomes. The fact that nuclear bodies were more numerous in the dark cells further enhances the probably higher metabolic activity of the clear cells. BHK cells showed few nuclear bodies. In both tumor and culture cells, type R or H virus-like particles could be detected. The high number of R or H particles observed in BHK and tumor cells, especially clear ones, suggests their participation in the oncogenesis of this neoplasm. The tumor cells contained several dilated endoplasmic reticulum cisternae with round and filamentous R type virus particles. Many tumor cells presented nuclear bodies of the filamentous and granular types.

- 6932 MORPHOLOGY OF TRANSPLANTABLE CHORIONIC TUMORS IN RATS. (E.) Miyamoto, M. (Osaka Univ. Med. Sch., Japan), K. Matsumoto and T. Sugaya. *Tohoku J Exp Med* 111(2):175-178, 1973.

Three lines of transplantable chorionic tumors have been established. They were numbered m-673, m-731 and m-786. At present they have been transplanted in Wistar-Furth rats for over 25 generations. The morphology of both m-673 and m-731 has been examined. Biological behavior and morphological characteristics of parent tumors resembled those of the human choriocarcinoma. At the 2nd generation of m-731 syncytial giant cells appeared similar to those of syncytium of villi in humans. At about the 20th generation, most recipients of m-673 and m-731 developed terminal ascites. Pulmonary metastases were found in some recipients of m-673 and microscopic appearance was the same as at the site of the original inoculation. Histological appearance of these two lines were similar to each other and with the advance of

generations of transplantation, PAS positive substance in the cytoplasm gradually decreased. The conversion of ^3H -pregnenolone to ^3H -progesterone using a piece of tumor of m-673 *in vitro*, while no ^3H -progesterone was identified from ^3H -pregnenolone in the liver, spleen or muscle, demonstrated that transplantable tumor of m-673 forms progesterone from pregnenolone, indicating the presence of a 3β -ol-dehydrogenase-isomerase enzyme system of normal rat placenta on this m-673 tumor.

- 6933 SPONTANEOUS TUMORS IN WISTAR RATS. (Rus.) Nifatov, A. P. (Inst. Biophys., Ministry Hlth. USSR) and N. A. Koshurnikova. *Vopr Onkol* 19(12):83-86, 1973.

Of 1026 Wistar rats (504 males and 522 females), 444 developed spontaneous tumors (40.0% of the males and 46.4% of the females). Taking into consideration that some rats developed two or three tumors, the total number of tumors observed was significantly greater in females (68.2%) than in males (51%). Malignant neoplasms were found in 12.5% of the males and in 8.2% of the females. These malignant tumors accounted for 24.5% of all neoplasms in males but for only 12.7% of those in females. Tumors occurred most often in the endocrine organs (32.6% in males and 41.4% in females) and, in females, in the mammary glands (16.6%). Endocrine tumors (26% of all tumors) were located primarily in the pituitary and adrenal cortex (pheochromocytomas). Mammary tumors consisted primarily of fibroadenomas; adenomas and cystadenomas were rarer, and only a few adenocarcinomas were found. Tumors in other sites were considerably less common (0.38% in males and 9.3% in females). Spontaneous tumors of the hematopoietic system were encountered more frequently in males (9.3%) than in females (3.8%). They consisted primarily of reticulum cell sarcomas of the lungs and, more rarely, the mesentery. These tumors were caused by chronic inflammation in the lungs and small intestine.

- 6934 SPECIFIC GLUCOCORTICOID BINDING IN HUMAN HEMOPOIETIC CELL LINES AND NEOPLASTIC TISSUE. (E.) Gailani, S. (Roswell Park Mem. Inst., Buffalo, N.Y.), J. Minowada, P. Silvernail, A. Nussbaum, N. Kaiser, F. Rosen and K. Shimaoka. *Cancer Res* 33(11):2653-2657, 1973.

Triamcinolone acetonide- ^3H (TA- ^3H) binding to subcellular macromolecular fractions was studied in three human lymphoid cell lines (HR1K, RPMI 8226, and MOLT-4), in four lymphosarcomatous tumors, and in leukemic leukocytes obtained from the peripheral blood of three patients with acute lymphocytic leukemia, six with acute myelocytic leukemia, eight with chronic lymphocytic leukemia, and two with chronic myelocytic leukemia. Specific binding, which was manifested by a high binding affinity of TA- ^3H to the macromolecular fractions and by a greater inhibition of this binding by cortisol, compared with that of inactive steroid epicortisol, was found in the lymphoid cell lines, lymphosarcomatous tissue,

acute lymphocytic leukemia cells, and two of the six acute myelocytic leukemia cells. Sedimentation coefficients "S" of the TA-³H macromolecular complex were studied in one of the lymphosarcomatous tumors. When the cells were incubated at 0 C, extraction with low-salt buffer produced a 6.5 S TA-³H macromolecular complex, while extraction with high-salt buffer produced a 4 S complex. After incubation at 37 C, extraction with high-salt buffer produced a 4 S complex, while extraction with low-salt buffer yielded only a small amount of the complex sedimenting at 6.5 S. However, a 4 S complex was extracted with high-salt buffer from the 27,000 X g pellet of the low-salt extract, suggesting that incubation at 37 C resulted in movement of the TA-³H macromolecular complex into the nucleus. Incubation of HRLK cells in the presence of 10⁻⁵ and 10⁻⁴ M cortisol resulted in a 22.5 and 50% inhibition of uridine-³H uptake by the cells, while incorporation of the uridine-³H into cellular RNA was inhibited only after incubation with 10⁻⁴ M cortisol. The relative insensitivity of these cells to cortisol, despite their high specific-binding capacity, indicate that factors other than steroid binding by the subcellular fractions play an important role in determining the sensitivity of cells to glucocorticoid action.

- 6935 EFFECTS OF N⁶-MONOBUTYRYL-CYCLIC AMP ON GLUTAMATE DECARBOXYLASE ACTIVITY IN FETAL RAT BRAIN CELLS AND GLIAL TUMOR CELLS IN CULTURE. (E.) Schrier, B. K. (Natl. Inst. Child Hlth. Human Development, Bethesda, Md.) and D. L. Shapiro. *Exp Cell Res* 80(2):459-462, 1973.

Cultures of fetal rat brain cells were treated chronically with 1 mM N⁶-monobutryl-3',5'-cyclic adenosine monophosphate and assayed at various times for protein and for glutamate decarboxylase activity. Treated cultures increased their protein content very slowly, but showed a very early 2.5-fold increase in enzyme specific activity. This degree of stimulation persisted during temporal development of the enzyme activity. The stimulated levels of specific activity were nearly as great as those in adult rat brain homogenates. Similar treatment of cells from two rat gliomas, which also contain the enzyme activity, did not mimic the effect found in brain cultures. The effects on glutamate decarboxylase were very different from those on another enzyme of neurotransmitter synthesis, choline acetyltransferase, suggesting that different cell types may have been responsible for the two dissimilar effects of the cyclic nucleotide treatment.

- 6936 MALE BREAST CANCER. 5. CLINICAL MANIFESTATIONS IN 257 CASES IN DENMARK. (E.) Scheike, O. (Finsen Inst., Copenhagen, Denmark). *Br J Cancer* 28(6):552-561, 1973.

A series of 257 cases of carcinoma of the male breast in Denmark during the period from January 1, 1943 to July 1, 1972, was reviewed, and a number of clinical symptoms were recorded and assessed. Male breast carcinoma comprised 0.8% of all breast car-

cinomas in Denmark. The average age was 65.2 yr, which is considerably higher than in women. The median duration of symptoms was 6 months. In only 13% of the cases was a palpable tumor the single symptom present on referral. In 27%, ulceration was found on admission. However, ulceration was not, as commonly supposed, a particularly early manifestation of male breast cancer. It has been proved that ulceration is significantly related to the duration of symptoms and tumor size. According to the TNM classification, 35% of the 253 cases classified were in stage I, 11% were in stage II, 42% were in stage III, and 12% were in stage IV. There was a significant correlation between the duration of symptoms and the clinical stage, and the histological degree of malignancy and the clinical stage. Expressed by the classification into stages, the clinical picture was definitely more favorable on referral during the period 1958-72 than during the period 1943-57.

- 6937 EXTRAGONADAL EMBRYONAL CARCINOMAS. (E.) Silva Duarte, C. A. (Lisbon U. Faculty Med., Portugal), M. L. Cristina and J. Roza de Oliveira. *Pathol Eur* 8(3):187-191, 1973.

Among 11 sacrococcygeal teratomas, there were two cases of so-called presacral choroid teratoma. Ten patients were female and one, with choroid teratoma, was male. The diagnosis was made at birth in all instances except in the two cases of choroid teratoma, in which the tumor only became palpable at the age of 1 yr and 1 yr, 8 mos. Both of the latter patients were operated on and underwent postoperative radiation therapy and chemotherapy, dying 3 and 5 months after surgery, resp. The tumors were soft and friable, consisting of clear cells with scanty cytoplasm and forming glanduliform structures and anastomosing strings. Papillary masses with loose connective tissue axis were found inside cavities. These structures were similar to those described in sacrococcygeal embryonal adenocarcinomas and in the gonadal tumors arising from endodermal cells of the extraembryonic sac (extraembryonic sac or yolk sac carcinoma of Teilum). It appears, therefore, that presacral choroid teratoma, a monophyletic teratoma, is an embryonal adenocarcinoma of extragonadal localization.

- 6938 POLYAMINE CONTENT OF AKR LEUKEMIC CELLS IN RELATION TO THE CELL CYCLE. (E.) Heby, O. (Natl. Inst. Hlth., Baltimore, Md.), G. P. Sarna, L. J. Marton, M. Omine, S. Perry and D. H. Russell. *Cancer Res* 33(11):2959-2964, 1973.

In AKR mice that develop spontaneous lymphoid leukemia, the thymus is the organ of primary involvement. Thymic cells from normal mice, as well as from mice with advanced leukemia, were separated according to size by sedimentation in a 1 x g sucrose gradient, the larger cells sedimenting further than the smaller cells. The fractions thus obtained, which correspond to successive phases of the cell cycle, were collected and subjected to polyamine analysis. In the G₀ phase of the cell cycle the spermine con-

tent was higher than in the G₁ phase, whereas the putrescine and spermidine content were similar in these two phases. The cellular content of putrescine, spermidine, and spermine increased progressively as the cells traversed the cell cycle from G₁ to M. In fact, the amount of all these amines was increased in the G₁ + S fraction. In the fraction corresponding to the G₂ + M phases, the polyamine content was twofold that in the G₁ phase. This increase in the polyamine content was seen first putrescine, then with spermidine, and finally with spermine. This sequential pattern reflects the order of synthesis of the polyamines, *i.e.*, putrescine being the precursor of spermidine and spermidine the precursor of spermine.

- 6939 ACID PHOSPHATASE CYTOCHEMISTRY OF MITOGEN-TRANSFORMED NORMAL AND CHRONIC LYMPHOCYTIC LEUKEMIA LYMPHOCYTES. (E.) Cohnen, G. (Dept. Med., U. Essen, Germany), S. D. Douglas, E. König and G. Brittinger. *Exp Cell Res* 80(2):297-304, 1973.

Acid phosphatase cytochemistry was performed on lymphocytes stimulated *in vitro* with phytohemagglutinin, pokeweed mitogen, or concanavalin A. These electron microscopic studies demonstrated that activated lymphocytes from both normal humans and patients with chronic lymphocytic leukemia (CLL) had an increased number of lysosomes relative to resting cells. At the time of maximum thymidine incorporation, a reduced number of lysosomes was present in many transformed CLL lymphocytes, mainly medium-sized blast cells, in comparison to transformed normal cells. The findings demonstrate a lysosomal abnormality in phyto mitogen transformed CCL lymphocytes which may be related to functional defects of these cells or to an incomplete transformation of a residual population of normal lymphocytes.

- 6940 FIBROSARCOMA IN EARLY INFANCY. (E.) Dahl, I. (Dept. Pathol. II, U. Gothenburg, Sweden), J. Save-Soderbergh and L. Angervall. *Pathol Eur* 8(3):193-209, 1973.

Of ten cases of fibrosarcoma in early infancy (3 yr old or less), eight of the patients were girls and four of the tumors were observed after birth. The tumors grew rapidly and appeared to be painless. All but one of the tumors were situated on the head or on the extremities with involvement of fascia or skeletal muscle. Fibrosarcomas in early infancy may be divided into two types, desmoplastic and medullary. The first type, represented by three cases in the present series, showed interlacing bundles of fibroblasts and collagen in varying amounts, and seemed to be related to or identical with fibrosarcomas occurring in adults. The other type, represented by the additional seven cases, was highly cellular, compact, presented a homogeneous and monotonous appearance, and exhibited monomorphic tumor cells, which, on the basis of the light and electron microscopic studies, appeared to be immature fibroblasts. Follow-up information on all of the patients showed local recurrence in three patients with the medullary type of fibrosarcoma, but

signs of metastatic spread were not found. Desmoplastic fibrosarcoma is known from earlier studies to be capable of metastasizing while medullary fibrosarcoma is not. With respect to a benign clinical course, medullary fibromatosis is perhaps a better term than medullary fibrosarcoma; however the latter term is to be preferred as long as the true nature of this type of lesion has not been definitely established. The differential diagnoses of benign fibroblastic lesions as well as malignant tumors such as dermatofibrosarcoma protuberans, synovial sarcoma, and histiocytosis X is discussed.

- 6941 LEIOMYOSARCOMA OF THE VEIN. REVIEW OF THE LITERATURE AND REPORT OF A CASE. (E.) Larri, T. K. I. (Dept. Surg., U. Oulu, Finland) and T. Niinimäki. *Scand J Thorac Cardiovasc Surg* 7(3):262-266, 1973.

Since 1871, 39 cases of primary leiomyosarcoma of the vein have been reported, with the majority having been reported in the last 15 yr. Leiomyosarcomas are divided into two groups, caval vein and peripheral vein tumors. The former are more common among females, while the latter are more common among males. The tumors generally occur in the fifth to sixth decades of life. Preoperative diagnosis of the condition is difficult, the symptoms depending on the localization of the venous obstruction produced by the tumor and on the completeness of the obstruction. Operative therapy is generally preferable, and the results, especially for peripheral vein tumors, are often satisfactory, despite the tendency of later metastasis. The occurrence of the 40th case of leiomyosarcoma is discussed. The caval vein tumor was found in a 60-yr-old woman and was surgically removed. Two yr later, a metastasis was surgically removed from the patient's left shoulder, and radiography has revealed a second metastasis in the lower left lung. Nevertheless, the general condition of the patient remains good.

- 6942 QUANTITATIVE ESTIMATIONS OF RNA SENSITIVE TO MILD RNase TREATMENT IN SECTIONS OF NORMAL, REGENERATING, AND NEOPLASTIC RAT LIVERS. (E.) Lepage, R. (Hosp. Notre-Dame, Montreal, Canada), M. C. Moulin-Camus, G. de Lamirande and R. Daoust. *Cancer Res* 33(11):2609-2614, 1973.

Histochemical and biochemical analyses were carried out to determine what proportion of the cellular RNA is responsible for the hyperbasophilic properties of cancer cells. Sections from normal, regenerating, cirrhotic, and neoplastic livers were submitted to mild ribonuclease (RNase) treatment, which abolishes hyperbasophilia, or to perchloric acid treatment for total RNA extraction. The amounts of digested material were estimated by ultraviolet spectrophotometry. The mild RNase treatment extracted 4 to 10% of the total RNA from sections of the various control livers. With sections of rat hepatoma, on the other hand, 25% of the total RNA was removed by mild RNase treatment, and cytoplasmic hyperbasophilia was abolished in stained tissue sections. The highly sensitive RNA particular to tumor cells would thus represent approximately

18% of the total tumor RNA and 24% of cytoplasmic RNA. These results indicate that hepatomas differ from normal and control livers in their high proportion of cytoplasmic RNA, possibly ribosomal RNA, showing increased sensitivity to attack by RNase and greater affinity for basic dyes.

- 6943 HIGH- AND LOW-TUMORIGENIC CULTURE LINES OF RAT UTERINE ADENOCARCINOMA AND THEIR ISOZYME PATTERNS OF LACTATE DEHYDROGENASE AND HEXOKINASE. (E.) Sekiya, S. (Sch. Med., Chiba U., Japan), Y. Kikuchi and H. Takamizawa. *Cancer Res* 33(12):3324-3329, 1973.

The isozymes of lactate dehydrogenase (LDH) and hexokinase were studied in high- and low-tumorigenic cloned cells of rat uterine adenocarcinoma originally induced by 7,12-dimethylbenz[a]anthracene *in vivo*. Only LDH-5 (muscle type) and LDH-4 were detected in high-tumorigenic cells. However, in addition to LDH-5 and LDH-4, LDH-3 was present in low-tumorigenic cells, whereas normal rat endometrial tissue contained all five isozymes of LDH. The specific activity of the enzyme was higher in high- than in low-tumorigenic cells, which had still higher activity than normal endometrium. Both uterine adenocarcinoma cells were characterized by a marked type II hexokinase, as well as a weak type I hexokinase, and by a loss of type III hexokinase, which was detected in normal endometrium, as were types I and II. Specific hexokinase activity was also highest in the high-tumorigenic cells. When these culture cells were reinoculated into isologous hosts, LDH-3, -2, and -1 and type III hexokinase appeared in the tumor tissues. No significant difference in these isozyme patterns was detected between the tumors that developed by inoculation of high- and low-tumorigenic cells.

- 6944 MALIGNANT MELANOMAS OF THE FEMALE GENITALIA. PART II. (Ger.) Hempel, J. (Pathol. Inst., Wiesbaden Clinic, Germany) and W. Remmele. *Z Haut Geschlechtskr* 48(17):711-723, 1973.

Case reports are presented for four patients with malignant melanomas of the female genitalia. A 45-yr-old woman had a small unpigmented malignant melanoma removed from the labia minor. A vulvectomy was performed four wk later, and histological examination revealed an amelanotic melanoma which developed against a background of circumscribed preblastomatous melanosis. A total hysterectomy was performed 21 months later for a granulosa cell tumor of the left ovary. Lymph node metastases began to develop 30 months after removal of the primary tumor, and the patient died with generalized metastases 13 months later. A malignant melanoma was found on the labia minor of a 19-yr-old woman during pregnancy. Bilateral inguinal lymphadenectomy was performed eight wk later, and the primary tumor was removed four wk after this. Distant lymph node metastases developed 3.5 yr after removal of the primary tumor, and the patient died after 12 wk with metastases in the brain and lungs. A 71-yr-old patient with a very small malignant melanoma of the clitoris underwent surgery for its removal along with bilateral

inguinal lymphadenectomy. Two wk later a small metastasis was removed next to the clitoris, and the patient received radiotherapy. No recurrences or palpable lymph nodes are present 17 months later. A small polypous malignant melanoma was removed from the vaginal fornix of a 58-yr-old woman, and almost complete resection of the vagina was performed ten days later. No evidence of a recurrence or metastasis is present 3.5 yr later. On the basis of 351 malignant melanomas reported in the literature, statistics are presented for the site of these tumors in the female genitalia.

- 6945 SIMILARITY OF RIBOSOMAL AND RIBOSOMAL PRECURSOR RNA'S FROM RAT LIVER AND THE NOVIKOFF ASCITES HEPATOMA. (E.) Sitz, T. O. (Baylor Coll. Med., Houston, Tex.), R. N. Nazar, W. H. Spohn and H. Busch. *Cancer Res* 33(12):3312-3318, 1973.

The ^{32}P -labeled ribosomal RNA's and their precursors in rat liver and the Novikoff hepatoma were examined using two competitive hybridization techniques and nucleotide analyses. Significant differences were not found between the corresponding RNAs of these tissues via competition of labeled RNA from the hepatoma with unlabeled 18 and 28 S ribosomal RNA and 28 and 45 S nucleolar RNA of liver and hepatoma by sequential or simultaneous competition hybridization. Differences were found in the specific activity of ^{32}P -labeled nucleotides, but no significant differences were found by ultraviolet light absorbancy in the distribution of short oligonucleotides after digestion with pancreatic ribonuclease. These data provide evidence that the previously reported differences in nucleotide composition and oligonucleotide distribution were probably the result of nonuniform labeling rather than differences in the primary sequences. Accordingly, the primary structures of ribosomal RNA's and their precursors appear to be conserved in oncogenesis.

- 6946 ASSOCIATION BETWEEN INFLUENZA DURING PREGNANCY AND CHILDHOOD LEUKAEMIA. (E.) Hakulinen, T. (Finnish Cancer Registry, Helsinki), L. Hovi, M. Karkinen-Jääskeläinen, K. Penttinen and L. Saxen. *Brit Med J* 4(5887):265-267, 1973.

A total of six epidemics of influenza were studied. Of 180,862 children born during the epidemics or within 9 months following an epidemic, 79 had leukemia. This did not differ significantly from the incidence of leukemia in control subjects. The development of malignancy showed no association with the stage of pregnancy when the mother contracted influenza. During the time period of Asian influenza exposure, 35,248 births resulted in 24 patients with leukemia during a 10-yr follow-up. This was significantly greater than the 100 leukemia cases in the 226,308 control births. These results support the conclusion that the 1957 Asian influenza epidemic correlates with the occurrence of leukemia in children exposed *in utero*, but similar associations between other influenza epidemics and childhood

leukemia were not revealed. It is suggested that a profound alteration occurred in the properties of the hemagglutinating and neuraminidase subunits of the Asian influenza virion surface. This appearance of a "new" influenza virus against which few antibodies exist in the world may result in more drastic consequences than other influenza epidemics.

- 6947 INHIBITION OF CELL DIVISION IN MAMMALIAN CELL CULTURES BY HYPERTONIC MEDIUM. (E.) Wheatley, D. N. (U. Med. Bldg., Foresterhill, Aberdeen, Scotland) and B. Angus. *Experientia* 29(11):1393-1395, 1973.

HeLa S-3 cells in a medium strength of about 215 mM and above underwent metaphase arrest. Above 240 mM pyknotic changes became increasingly pronounced in both mitotic and interphase cells. At 227 mM chromosomes exhibited a well-defined spindle. Metaphase cells held for 2-3 hr at 227 mM showed definite anaphase movements of individuals or groups of chromosomes. Results of this study indicate that raised medium strength trapped HeLa cells in metaphase, yet allowed a normal G₂ population to enter mitosis and retarded progression of S phase cells. At the 227 mM level of hypertonicity, no evidence of prophase induction or nuclear chromatin condensation was noted. This study clearly demonstrated that hypertonically collected metaphases remain readily reversible for 3-4 hr but degenerate quickly if held longer. Hypertonic treatment did induce immediate metaphase arrest, but isotonically collected anaphases and telophases in hypertonic medium showed unusual nuclear behavior after completing normal cytokinesis involving the lobulation of the nucleus often into two roughly equal parts before further lobulation. The technique of hypertonic treatment aids in synchronization of cells by mechanical collection in metaphase. A good yield of nearly pure metaphase cells is achieved. The mechanism of metaphase arrest is unknown, but there is no evidence of spindle abnormality. Chromosomes do tend to be supercondensed and more sticky, probably preventing their anaphase separation.

- 6948 MOUSE TERATOCARCINOMA: ISOLATION, CULTURE AND PROPERTIES OF CELLS WITH MULTIPLE POTENTIALS. (Fr.) Jakob, H. (Dept. Cell Genetics, Coll. France, Paris), T. Boon, J. Gaillard, J.-F. Nicolas and F. Jacob. *Ann Microbiol (Inst Pasteur)* 124 B(3):269-282, 1973.

Four new lines of primitive cells were obtained by culturing embryonic cells from the ascites fluid of transplantable mouse teratoma passaged by implantation into the testes of adult 129 Sv mice. All of these cell lines, and 21 of the 22 clones derived from them, showed multitissue differentiation which persisted *in vitro* for at least one yr. Two of the 20 clones were mutants which were resistant to azaguanine at concentrations higher than 45 µg/ml and which died rapidly in HAT medium (100 µM hypoxanthine, 10 µM aminopterin, 16 µM thymidine). This suggests that these two clones contain no hypoxanthine-

guanine-phosphoribosyl transferase. All of the cell lines multiplied rapidly with generation times ranging from 10 to 15 hr, and all had approximately 40 chromosomes/cell. Only telocentric chromosomes were present in three of the four lines; the remaining line had one or two metacentric chromosomes. Multiple tumors appeared at the site of injection or in the abdominal cavity 14 to 40 days after i.p. or s.c. injection of 2×10^6 cells into male or female 129 Sv mice. The two azaguanine-resistant clones also induced tumors. All of the tumors consisted of embryonic or fetal tissue which never reached the terminal stage of development. An undifferentiated carcinomatous component was present in all cases, and tumor cells originated from all three germ layers, but primarily from the neuroepithelial component. The most rapidly growing tumors were the least differentiated.

- 6949 A GROWTH-STIMULATING FACTOR RELEASED BY CULTURED MOUSE MAMMARY TUMOR CELLS. (E.) Nair, B. K. (Dept. Zool., U. California, Berkeley) and K. B. De Ome. *Cancer Res* 33(11):2754-2760, 1973.

Medium from mouse mammary tumor cell cultures contained a growth-stimulating factor. The assay for growth-stimulating factor was performed on density-inhibited cultures of mouse embryo cells. The addition of nondialyzed or dialyzed mouse mammary tumor cell culture medium caused an increase in DNA synthesis and mitosis in density-inhibited cells. Dialyzed medium was more active than nondialyzed medium in stimulating growth. Normal mouse mammary cell culture medium also showed similar growth-stimulatory activity, but to a lesser extent than that showed by tumor cell culture medium. The growth-stimulating factor was precipitated from the culture medium with 60% saturated ammonium sulfate.

- 6950 DETERMINANTS FOR THE ESTABLISHMENT OF PERMANENT TISSUE CULTURE LINES FROM HUMAN GLIOMAS. (E.) Westermarck, B. (Dept. Neurosurg., U. Uppsala, Sweden), J. Ponten and R. Hugosson. *Acta Pathol Microbiol Scand (A)* 81(6):791-805, 1973.

Malignant gliomas, in contrast to other human neoplasms, frequently establish themselves as permanent tissue culture lines. Still, the major portion of malignant gliomas fail to do so. Determinants of the primary explant for the future successful establishment of gliomas were investigated. One medulloblastoma, one ependymoma, 4 oligodendrogliomas, 14 astrocytomas grade I and II and 68 astrocytomas grade III and IV were studied. Established lines were obtained only from grade III and IV gliomas. Male tumors more frequently established permanent lines (13/45) than did female tumors (1/23) and a higher success rate was found among temporo-parietal tumors (12/28 of the male tumors) than among those located in the frontal lobe (1/17 of the male tumors). No connection between the histologically predominant cell type of the grade III and IV gliomas and the rate of establishment was found. Studies of the primary glioma cultures implied that failure to form an established line in only a minor fraction could

be ascribed to failure of the tumor cells of the explant to adhere to the solid support. This was valid for all astrocytomas grades I and II, the ependymoma, and some of the grade III and IV gliomas. In the majority of malignant gliomas a rapidly occurring failure to multiply was found, leading to continuous death of the tumor cells while normal glia-like cells proliferated and outnumbered the neoplastic component. This might depend on a deficient interaction between the tumor cell and the solid support even though a lack of essential metabolites cannot be excluded.

- 6951 EFFECT OF HEPARIN, HISTAMINE AND SEROTONIN ON THE DENSITY-DEPENDENT INHIBITION OF REPLICATION IN TWO FIBROBLASTIC CELL LINES. (E.) Norrby, K. (II Dept. Path., U. Linköping, Sweden). *Virchows Arch [Zellpathol]* 15(1):75-93, 1973.

The effects of heparin, histamine, and serotonin, all of which are constituents of mast cells, on the density-dependent inhibition of replication was studied in normal human fetal lung fibroblast-like cells and the established 3T3 murine cell line. The cells were cultured in media supplemented with fetal calf serum. The human cells formed multilayered, tissue-like sheets, while the 3T3 cells formed confluent monolayers. Heparin in concentrations from 7.7×10^{-6} to 7.7×10^{-2} $\mu\text{g/ml}$ stimulated the multiplication of both cell types. Histamine and serotonin, however, significantly stimulated cell multiplication at very low concentrations, concentrations greater than or equal to $6.7 \times 10^{-7}\text{M}$ (histamine) or $7.4 \times 10^{-5}\text{M}$ (serotonin) being noxious. Mixtures of heparin, histamine, and serotonin produced effects similar to those seen with histamine or serotonin alone. The data indicate that mast-cell components may play an important role in the fibroblastic (mesenchymal) proliferative response which is an integral aspect of the inflammatory and wound-healing process. Heparin, histamine, and serotonin may act as multiplication-stimulating "cyto-hormones", possibly in cooperation with serum proteins.

- 6952 ENZYME ACTIVITIES AND EXTRINSIC PROTEINS IN PLASMA MEMBRANES FROM NORMAL LIVER AND MORRIS HEPATOMA 5123tc. (E.) Barclay, M. (Memorial Sloan-Kettering Cancer Ctr., Rye, N.Y.) and O. Terebus-Kekish. *J Natl Cancer Inst* 51(5):1709-1710, 1973.

Slowly growing, minimally deviated Morris 5123tc hepatomas were grown in male Buffalo rats and harvested before hemorrhage and necrosis developed. As compared with the plasma membranes from normal liver, somewhat less of the total hepatoma membrane protein is soluble in 0.15M NaCl. In addition, membrane preparations from hepatoma and normal liver contain a protein which is extrinsic to, and usually part of, the membrane; the hepatoma plasma membranes contain less of this protein. In the whole membranes from the tumors, the specific activities and relative specific activities for both 5'-nucleotidase and ATPase are significantly lower than

normal: lower values are also observed in the lipoprotein subfractions. These findings suggest greatly diminished phosphodiesterase and phosphotriesterase activities in the plasma membranes from the hepatoma. This, in turn, indicates that the metabolism of purines, pyrimidines, and nucleotides is either greatly diminished or nonexistent in the plasma membrane. The greatly diminished activities for 5'-nucleotidase and ATPase in the hepatoma plasma membranes may indicate the production of abnormal cell surfaces which are deficient in the molecules essential for certain critical cell functions.

- 6953 MALE BREAST CANCER-II. METABOLISM OF OESTRADIOL-17 β IN MEN WITH BREAST CANCER. (E.) Scheike, O. (Radium Ctr., Copenhagen, Denmark), B. Svenstrup and V. A. Frandsen. *J Steroid Biochem* 4(5):489-501, 1973.

A tracer dose of [^3H]-oestradiol-17 β was given intravenously to 19 male patients with breast cancer. The metabolism of this tracer was examined by measuring total radioactivity and the radioactive metabolites, estrone, 2-methoxyestrone, estradiol-17 β , and estriol in 48 hr urine samples. The metabolism of the tracer was compared with that in 19 healthy men and 5 men with nonendocrine malignant diseases; all were of comparable age. There was no statistical difference between the three groups of subjects. Total estrogens were measured in the urine of the three groups of subjects and no statistical difference between the groups was found. The results of this study do not indicate a specific estrogen excretion pattern or metabolism of estradiol-17 β in men with breast cancer.

- 6954 DIURNAL CHANGES IN MITOTIC ACTIVITY AND DNA SYNTHESIS IN RAT TUMORS AND NORMAL RAT TISSUE. (Rus.) Sokolova, L. V. (P. A. Gertsen Sci. Res. Inst. Oncol., Moscow, USSR), A. G. Musmafin, V. N. Dobrokhomov and S. I. Baluev. *Biull Eksp Biol Med* 76(12):64-67, 1973.

The mitotic index and labeling index were measured during the day in s.c. transplants of a spontaneous rat sarcoma and in the esophageal and corneal epithelium of these male noninbred albino rats with tumors. Animals were sacrificed every three hr during the day, one hr after i.p. injection of ^3H -thymidine. In the sarcoma two maxima occurred (at 7 a.m. and 10 p.m.) in the mitotic index, and two maxima occurred (at 10 a.m. - 1 p.m. and at 1 a.m.) in the labeling index. Thus, the maxima in DNA synthesis preceded maxima in mitotic activity by 6 and 9 hr, resp. Only one maximum/day was observed in the mitotic index and labeling index in the esophageal and corneal epithelium of these animals. The value for the mitotic index in the esophageal epithelium was somewhat lower than previously reported values obtained in intact rats. The amplitude of diurnal changes in the mitotic index and labeling index was considerably lower in tumor-bearing than in normal rats.

- 6955 THE GALLIUM-67 SCAN IN CLINICAL ASSESSMENT OF CANCER. (E.) Johnston, G. S. (Natl. Inst. Hlth., Bethesda, Md.), A. E. Jones, M. S. Milder, R. L. Frankel, R. J. Kramer and J. C. Arseneau. *J Surg Oncol* 5(6):529-538, 1973.

Seven hundred and seventy patients with malignancies were studied using Gallium-67 (^{67}Ga) citrate radioisotopic scanning. Of these, 21 had brain tumors, 19 (90%) of which concentrated ^{67}Ga . Forty-four patients with melanoma had 54% of proven sites visualized on ^{67}Ga scan (masses larger than 2 cm were detected in 75% of the sites). Ewing's sarcoma was studied in 15 patients with ^{67}Ga scanning and all 15 primary tumors were visualized. Thirty-two of 43 scans performed on 30 patients with acute leukemia were abnormal. Sites of leukemic involvement in bone marrow and as myeloblastomas in soft tissue took up high levels of ^{67}Ga . Patients with untreated Hodgkin's disease were abnormal in 90% of cases on ^{67}Ga scan, with 70% of the proven sites of involvement being detectable. Sixty percent of non-Hodgkin's lymphoma sites were detected on ^{67}Ga scans. Approximately 85% of the anatomic sites involved in lung cancer were detected. ^{67}Ga citrate whole body scanning has proven to be useful in diagnosing and staging a wide variety of human tumors. The ^{67}Ga study is most reliable when positive findings are recorded, but should be approached with caution when the findings are negative.

- 6956 SURFACE PARTICLES ON LEUKEMIC LYMPHOCYTES IN HUMANS. (E.) Narang, H. K. (Newcastle Gen. Hosp., Great Britain). *Cancer Res* 33(12):3216-3221, 1973.

Lymphocytes from 8 leukemia patients, 2 patients with infectious mononucleosis, 10 children with measles, and 10 normal subjects were examined microscopically. The leukemic lymphocytes were about five times larger than the other lymphocytes and contained on their surfaces unique virus-like particles which were similar morphologically to those associated with murine leukemia. The particles were seen in various stages of formation on the leukemic lymphocytes, and were about 400 to 500 nm in diameter with a nucleoid core of about 320 nm. Fully formed particles were never seen within the cytoplasm of the lymphocytes. Particles with a dense core and an overall diameter of 20 nm were commonly seen in the nuclei of some shrunken lymphocytes. It appears that the particles may in some way be related to the leukemia.

- 6957 EFFECTS OF RIBOFLAVIN DEFICIENCY UPON CONCENTRATIONS OF RIBOFLAVIN, FLAVIN MONONUCLEOTIDE, AND FLAVIN ADENINE DINUCLEOTIDE IN NOVIKOFF HEPATOMA IN RATS. (E.) Rivlin, R. S. (Francis Delafield Hosp., New York), R. Hornibrook and M. Osnos. *Cancer Res* 33(11):3019-3023, 1973.

The concentrations of riboflavin and of the two coenzymes derived from riboflavin, flavin mononucleotide and flavin adenine dinucleotide (FAD), were determined in Novikoff hepatoma grown i.p. and

in host liver of normal and riboflavin-deficient male Holtzman rats. Riboflavin deficiency prolonged the 50% survival time of tumor-bearing animals from 5.7 to 10.8 days. The growth of Novikoff hepatoma did not alter hepatic riboflavin, flavin mononucleotide, or FAD concentrations in either normal or riboflavin-deficient rats. In tumors from riboflavin-deficient rats, the concentration of FAD was nearly identical to that in tumors from animals on a normal diet. By contrast, in tumors from deficient animals, the flavin mononucleotide concentration was significantly lower than that in tumors from control animals. The free riboflavin concentration was decreased even further and was undetectable in one-third of the tumors from riboflavin-deficient animals. The FAD pyrophosphorylase activity was increased in the livers but not in the tumors from riboflavin-deficient animals.

- 6958 CANINE MALIGNANT MAMMARY TUMOURS. II. ADENOCARCINOMAS, SOLID CARCINOMAS AND SPINDLE CELL CARCINOMAS. (E.) Misdorp, W. (Netherlands Cancer Inst., Amsterdam), E. Cotchin, J. F. Hampe, A. G. Jabara and J. von Sandersleben. *Vet Pathol* 9(6):447-470, 1972.

Nine spindle cell carcinomas, 130 adenocarcinomas, and 76 solid carcinomas removed from bitches during surgery or at necropsy were classified morphologically. Among the adenocarcinomas, there were 37 tubular adenocarcinomas of simple type, 19 tubular adenocarcinomas of complex type; 45 papillary adenocarcinomas of simple type, 5 papillary adenocarcinomas of complex type, 16 papillary cystic adenocarcinomas of simple type, and 8 papillary cystadenocarcinomas of complex type. These tumors were generally found in old bitches, average age 11 yr. The solid carcinomas consisted of 56 solid carcinomas of simple type and 20 solid carcinomas of complex type. The solid carcinomas were generally found in old bitches, average age 11 yr. The spindle cell carcinomas were found in slightly younger bitches, average age 8 yr. The sites and gross appearances of these tumors are discussed, along with the clinical signs and course of the diseases in relation to pathological findings.

- 6959 ELEVATED STEROL SYNTHESIS IN LYMPHOCYTIC LEUKEMIA CELLS FROM TWO INBRED STRAINS OF MICE. (E.) Chen, H. W. (Jackson Lab., Bar Harbor, Me.), A. A. Kandutsch, H.-J. Heiniger and H. Meier. *Cancer Res* 33(11):2774-2778, 1973.

Cell suspensions of lymphocytes from the spleens, thymuses, and mesenteric lymph nodes of normal and leukemic mice of various strains actively converted acetate into sterols, fatty acids, and carbon dioxide. In the leukemic cells, sterol synthesis was greatly increased, whereas the rates of fatty acid synthesis and CO_2 production were only moderately, or not at all, affected. The activity of HMG-CoA reductase was also elevated in the leukemic spleen cells; the leukemic spleens weighed 3 to 10 times more than the normal spleens. The degree of enzyme activity in the leukemic spleens correlated well with the degree of

splenomegaly. The accelerated sterol synthesis in the tumor cells may reflect their rapid growth and division.

- 6960 CARCINOMA *IN SITU* OF THE UTERINE CERVIX: ITS USEFULNESS AS AN EXPERIMENTAL MODEL. (E.) Fuertes, G. A. (Nat. Register Path. Anat., Mexico) and J. E. Ayre. *Cancer Cytol* 12(2):11-23, 1972.

Cervical carcinoma *in situ* offers several advantages as an experimental model for measuring the cellular response to various cancer therapies. Carcinoma *in situ* is an initial preinvasive carcinoma of the uterine cervix, cancer of which is the most common malignancy among women. The malignancy may be accurately diagnosed by repeated cytological and histopathological examinations, which are relatively convenient and simple to perform. The preinvasive (intraepithelial) state of carcinoma *in situ* is of long duration and its progression from normal, to precancerous dysplasia, to carcinoma *in situ* can be easily followed. Using a cervical scrape test it is convenient to study the immediate and later responses of both carcinoma *in situ* and invasive carcinoma to immunotherapy, chemotherapy, radiotherapy, and hormone therapy; when all treatment is withheld, the frequency of spontaneous regression in carcinoma *in situ* is less than 1%. These methodologies provide an opportunity for extensive interdisciplinary study and do not require sophisticated laboratory equipment. Using the carcinoma *in situ* model, the precise mechanism of neoplastic transformation of the cervical epithelium may be learned.

- 6961 NUCLEAR BINDING OF TRITIATED ACTINOMYCIN IN BASAL CELL CARCINOMA AND IN NORMAL HUMAN EPIDERMIS. (E.) Heenen, M. (Sch. Med., U. Brussels, Belgium), A. M. Preumont and P. Galand. *Cancer Res* 33(11):2624-2626, 1973.

The ability of fixed histological samples from normal human epidermis and from human basal cell carcinomas to bind actinomycin D-³H was measured by autoradiography. The data revealed a 60% higher binding of actinomycin to the chromatin of the carcinomatous cells. The frequency histograms of tritiated actinomycin binding revealed the same grain count distribution around the mean value in the neoplastic cells as in the normal epidermis in ethanol:acetic acid fixed tissues as well as in neutral formalin fixed material. The data indicate that the chromatin in the neoplastic cells is less repressed than in normal basal cells.

- 6962 THE EFFECTS OF COUNTING THRESHOLD AND EMULSION EXPOSURE DURATION ON THE PERCENT-LABELED MITOSIS CURVE AND THEIR IMPLICATIONS FOR CELL CYCLE ANALYSIS. (E.) Shackney, S. E. (Nat. Cancer Inst., Bethesda, Md.), S. S. Ford and A. B. Wittig. *Cancer Res* 33(11):2726-2731, 1973.

Percent-labeled mitosis curves were obtained at different counting thresholds and emulsion exposure

durations in Sarcoma 180 cells grown *in vitro* and pulse labeled with tritiated thymidine. The shape of the percent-labeled mitosis curve was dependent on the counting threshold and on the emulsion exposure duration. At low counting thresholds and prolonged emulsion exposure durations, more mitoses were labeled than at higher thresholds and at shorter emulsion exposure times. The results could not be attributed to emulsion background noise. The data suggest that the onset and termination of DNA synthesis do not occur abruptly in individual cells as they progress through the cycle; the rate of DNA synthesis and corresponding nuclear tritium uptake rise gradually to a maximum, especially in cells with long cell cycle times. When conditions are such that there is increased detection of low levels of nuclear tritium uptake, the apparent duration of S phase is increased. It is suggested that the identification of distinctive patterns of relative labeling intensity as a function of age within the cycle may prove to be more useful than attempts to measure cell cycle phase durations in the kinetic characterization of growing cell populations.

- 6963 PARAMAGNETIC CHANGES DURING DEVELOPMENT OF A TRANSPLANTED AKR/J LEUKEMIA IN MICE AS MEASURED BY ELECTRON SPIN RESONANCE. (E.) Swartz, H. M. (Med. Coll. Wisconsin, Milwaukee), C. Mailer, S. Ambegaonkar, W. E. Antholine, D. R. McNellis and S. J. Schneller. *Cancer Res* 33(11):2588-2595, 1973.

Paramagnetic changes occurring during tumor development were studied in the mouse AKR leukemia (transplanted) model system using electron spin resonance. Paramagnetic changes were found only in the blood and in organs directly involved by the leukemic cells. The change in the blood consisted of an increase in a paramagnetic transition element complex and occurred prior to the tissue changes. In the liver, both free radicals and normally occurring transition elements decreased when the liver became extensively infiltrated by the leukemic cells. Similar results were found in the spleen, except that in the spleen there also was an increase of a paramagnetic transition element or elements, with an apparent g factor near $g = 2.003$, plus the development of additional hyperfine structure in proportion to tumor involvement. An early rise in free radicals, which has been reported as characteristic of tumor development, was not observed in these studies.

- 6964 CHARACTERIZATION OF PRIMARY HEPATOCELLULAR CARCINOMAS AND INITIAL TRANSPLANT GENERATIONS. (E.) Becker, F. F. (New York U. Sch. Med., New York City), K. M. Klein, S. R. Wolman, R. Asofsky and S. Sell. *Cancer Res* 33(12):3330-3338, 1973.

Male ACI rats were fed a diet containing FAA over four feeding cycles consisting of 3 wk on the FAA diet and 1 wk on a normal diet. Six hepatic tumors induced by this procedure were examined: three were primarily aneuploid and three were predominantly diploid; three were poorly differentiated hepatomas, two were well-differentiated hepatomas; and one

resembled a hepatic nodule with early malignant activity. Suspensions prepared from fragments of these tumors were injected s.c. into new hosts; transplantable hepatomas (THC) resulted. In terms of morphology, karyotype, plasma protein production, and α_1 -fetoprotein synthesis, the THC bore a strong similarity to the primary hepatocellular carcinomas from which they were derived. However, the THC presented a much more homogeneous phenotypic pattern than was seen in the original hepatocellular carcinomas. A relation between karyotype and function was also noted; the aneuploid, rapidly growing tumors produced relatively large amounts of normal plasma proteins and α_1 -fetoprotein, while the near-diploid tumors produced little or none.

- 6965 A GROWTH-STIMULATING FACTOR FROM SOLID MOUSE MAMMARY TUMORS. (E.) Nair, B. K. (Dept. Zool., U. California, Berkeley) and K. B. DeOme. *Cancer Res* 33(12):3222-3226, 1973.

A soluble fraction (SF) prepared from solid spontaneous primary mouse mammary tumors stimulated the growth of density-inhibited mouse embryo cells in monolayer culture. Dialysis of the SF increased its growth-stimulating activity. At higher concentrations, both nondialyzed and dialyzed SF's were inhibitory to cell growth. A similar preparation from normal mouse mammary gland showed some growth-stimulating activity. SF from the kidney of tumor-bearing or multiparous old mice showed high activity, while that from tumor-free virgin young mice did not show significant activity. Hyperplastic alveolar nodules of the mammary gland showed activity as high as that of tumors. The growth-stimulating factor in the SF was precipitated with 60% saturated ammonium sulfate, and the ammonium sulfate precipitate was further purified by Sephadex G-100 column chromatography.

- 6966 5'-NUCLEOTIDE PHOSPHODIESTERASE ISOENZYME AND HEPATIC CANCER IN NCI-MAYO CLINIC PANEL SERA. (E.) Tsou, K. C. (Sch. Med., U. Pennsylvania, Philadelphia), M. G. McCoy, H. T. Enterline, R. Herberman and H. Wahner. *J Natl Cancer Inst* 51(5):2005-2006, 1973.

NCI-Mayo Clinic panel sera were analyzed for the presence or absence of an isoenzyme of 5'-nucleotide phosphodiesterase. The results were positive for 12 of the 51 sera, including 4 of the 6 cases of hepatoma. All four primary hepatomas were positive, grade 2 and above. The two negative hepatomas were grade 1 and were from the same patient, with specimens taken 6 months apart. Microscopic examination of these grade 1 hepatomas indicated that they could have been classified as benign liver adenomas. Thus, this test may be useful in distinguishing benign from malignant liver tumors. However, since the test results were positive for three non-cancerous cirrhosis cases, the application of the test to the diagnosis of liver diseases

would be useful only in conjunction with other liver function tests (e.g., the α -fetoprotein test).

- 6967 KARYOLOGIC STUDY OF A RENAL DYSEMBRYOMA (DNV) AND NORMAL CHICK CELLS. (Fr.) Deleon, I. (G. Roussy Inst., Villejuif, France), T. Huynh and F. Lacour. *Bull Cancer (Paris)* 60(2):235-239, 1973.

Chromosome studies were made on primary chick embryo tissue cultures, fibroblasts after the second and tenth passages *in vitro* and primary cultures of normal kidney from Brown Leghorn chicks. These results were compared with those obtained on virus-induced nephroblastic dysembryomas after *in vitro* explantation. While most normal cells had 74 autosomes plus a Z sex chromosome in females and 74 autosomes plus two Z sex chromosomes in males, variations did occur and 71-76 autosomes were observed in some cases. These variations were also found in tumor cells. No anomalies were found in the number or structure of macrochromosomes in the tumor karyotypes. These findings conflict with those of Cox who did find chromosome anomalies in a study of 77 human nephroblastomas.

- 6968 CHROMOSOME ANALYSES OF A METASTATIC GASTRIC CARCINOMA INCLUDING QUINACRINE FLUORESCENCE. (E.) Granberg, I. (Karolinska Inst., Stockholm, Sweden), S. Gupta and L. Zech. *Hereditas* 75(2):189-194, 1973.

Chromosomes obtained from the pleural effusion of a 63-yr-old woman with metastatic gastric carcinoma were studied by quinacrine fluorescence. The majority of the tumor cells contained 49 ± 1 chromosomes with the tumor cell population showing considerable uniformity in its deviations from the normal karyotype. Trisomy was observed in chromosomes A3, C7, and C8 and structural deviations were seen in chromosomes A1, B4, C12, E17, and X.

- 6969 CHROMOSOMAL ANALYSIS OF WALKER CARCINOSARCOMA-256: KARYOLOGICAL DIFFERENCES IN TWO SUBLINES AND THEIR ORIGINAL LINE. (E.) Kajino, G. (Nagoya U. Sch. Med., Japan), T. Murase, Y. Terashima and H. Amo. *Gann* 64(6):629-632, 1973.

Two sublines of the Walker carcinosarcoma-256 (WT, which was transplanted intramedullary; and WS, which was inoculated subcutaneously) and their original line (WO, transplanted subcutaneously) were transplanted into female Sprague-Dawley rats. The tumors were then karyotyped. The only difference between the WS line and the WT line was in the chromosome complements of the B and C groups. However, a marked difference in the chromosome constitution of the WO line as compared with the two sublines was evident in the presence of one medium-sized metacentric chromosome in the marker group and the absence of a minute chromosome in other groups of the WO cells; minor differences in the chromosome constitutions of

the B and C groups were also found. The pathways through which the chromosome constitutions of the two sublines developed from the original W0 tumor are unknown.

- 6970 THE INHIBITORY EFFECT OF DIETHYLAMINOETHYL DIPHENYLVALERATE (SKF 525-A) ON GLUCURONIDATION BY CULTURES OF RAT HEPATOMA CELLS. (E.) Dybing, E. (Inst. Pharmacol. U. Oslo, Norway) and H. E. Rugstad. *Acta Pharmacol Toxicol* 32:112-118, 1973.

Diethylaminoethyl diphenylvalerate (SKF 525-A) at concentrations of 10^{-5} M to 2×10^{-4} M inhibited the glucuronidation of *p*-aminophenol (PAP), *p*-nitrophenol (PNP), and bilirubin by a clonal strain of rat hepatoma cells (MH₁C₁) grown in culture. At higher SKF 525-A concentrations, the glucuronidation of PAP and PNP in a homogenate system from the cell cultures and normal rat liver was also inhibited, PAP being affected to the greatest extent. The inhibition of PAP glucuronidation in the homogenate system appeared to be noncompetitive. SKF 525-A apparently inhibits the entrance of PAP and PNP into intact living cells.

- 6971 REASSOCIATION OF NORMAL MOUSE DNA AND MOUSE PLASMOCYTOMA DNA. (E.) Mori, K. (Fac. Med. U. Louis Pasteur, Strasbourg, Cedex, France), M. Wintzerith and P. Mandel. *FEBS Lett* 35(1):7-10, 1973.

Solid MPCII plasmocytoma cells were transplanted into Balb/c mice, which were subsequently injected with (³H)methyl-thymidine (300 μ Ci/mouse). DNA was prepared from the liver and tumor nuclei of these animals, and fractionated into single-stranded DNA. The reassociation curves obtained with liver DNA-liver DNA, tumor DNA-tumor DNA, liver DNA without satellite DNA, and liver DNA-tumor DNA duplexes were very similar and resembled those commonly obtained for mouse DNA. The data indicate that there is no loss of sequences or appreciable presence of supernumerary sequences in tumor DNA as compared to normal DNA.

- 6972 METABOLIC CHANGES IN BREAST CARCINOMA. I. URINARY EXCRETIONS OF KETOSTEROID AND CATECHOLAMINE. (E.) Maity, C. R. (Inst. Med. Sci., Banaras Hindu U., Varanasi, India) and D. P. Burma. *Indian J Cancer* 10(3):351-355, 1973.

The urinary levels of two hormonal metabolites, 17-ketosteroid and catecholamine, were measured in 40 females and 1 male with breast cancer, as well as in 20 normal females. The urinary catecholamine levels were slightly, although insignificantly, elevated in the breast cancer patients. The urinary levels of 17-ketosteroid were significantly subnormal in patients showing early (T₁ and T₂) stages of breast cancer. Patients with advanced breast cancer (T₃ and T₄) with lymph node metastasis excreted nearly normal amounts of 17-ketosteroid, with the progress of the disease being rapid in those with subnormal urinary levels.

- 6973 ALDEHYDE DEHYDROGENASE ISOZYMES IN RAT HEPATOMA-MOUSE FIBROBLAST HYBRIDS. (E.) Rintoul, D. (Dept. Physiol. Cell Biol., U. Kansas, Lawrence), R. F. Lewis, Jr. and J. Morrow. *Biochem Genet* 9(4):375-387, 1973.

The activity of aldehyde dehydrogenase isozymes was studied in rat hepatoma cells (HTC line) and mouse fibroblasts (LMTK⁻ line) and their somatic cell hybrids. The enzyme activities of the HTC line and the hybrid line were about the same, while the LMTK⁻ line displayed no detectable enzyme activity. The enzyme was not present in the newly formed hybrids, appearing only after several wk. The enzyme in the hybrids was significantly different (e.g., more heat labile) from that in the HTC parent and was probably not entirely of HTC origin. It is concluded that rat aldehyde dehydrogenase behaves as a genetic recessive in this system and that this property is correlated with chromosome loss.

- 6974 OVARIAN NEOPLASMS IN CHILDREN AND ADOLESCENTS. (E.) Sawai, M. M. (Tata Mem. Hosp., Bombay, India) and M. V. Sirsat. *Indian J Cancer* 10(3):302-311, 1973.

Sixty seven primary ovarian neoplasms were removed from 63 patients under the age of 20 yr. About 77.5% (67% malignant) of these tumors were of germ cell origin, with the remainder being of coelomic epithelial origin (12%, all malignant), specialized stromal origin (6%), nonspecialized stromal origin (1.5%), or of uncertain histogenesis (3%). The neoplasms of germ cell origin consisted of dysgerminomas (most commonly encountered), benign cystic teratomas, malignant teratomas, and embryonal carcinomas. The neoplasms of coelomic epithelial origin consisted of cystadenomas and adenofibromas, cystadenocarcinomas, and borderline neoplasms. The neoplasms of specialized stromal origin consisted of granulosa cell carcinomas and thecomas, while the neoplasms of nonspecialized stromal origin consisted of fibromas. Gonadoblastomas comprised all of the tumors of uncertain histogenesis in this series. The histogenesis and histology of these tumors are discussed.

- 6975 METABOLIC CHANGES IN BREAST CARCINOMA. II. PHOSPHOHEXOSE ISOMERASE AND LACTIC DEHYDROGENASE LEVELS IN SERUM. (E.) Maity, C. R. (Inst. Med. Sci., Banaras Hindu U., Varanasi, India) and D. P. Burma. *Indian J Cancer* 10(3):356-360, 1973.

The levels of two glycolytic enzymes, lactic dehydrogenase (LDH) and phosphohexose isomerase (PHI), were measured in the sera of 29 female breast cancer patients and 20 normal controls. There was a slight, but statistically insignificant, rise in the LDH levels in the sera from the cancer patients. The highest LDH levels were noted in patients with distant metastasis. The serum LDH levels showed no significant changes after therapy. The serum PHI levels were considerably elevated

in the breast cancer patients, with the PHI level increasing with the stage of the disease. The serum PHI levels dropped after mastectomy, the maximum drop occurring within 4 days after surgery. Following radiotherapy, the serum PHI level dropped gradually up to the fourth wk after treatment. In neither case, did the serum PHI levels reach normal values. It is possible that the serum PHI level could be used as an early diagnostic tool to indicate the onset of breast cancer.

6976 ESTABLISHMENT OF NEW MOUSE AND HUMAN PIGMENTED MELANOMA LINES IN TISSUE CULTURE.

(E.) Horn, D. (Children's Hosp. Med. Ctr., Boston, Mass.), C. de Montchalin and R. L. Davidson. *Yale J Biol Med* 46(5):361-367, 1973.

Two new stably pigmented melanoma lines, one of human origin (RN) and one of murine origin (HP), were established in tissue culture. Both pigmented and unpigmented subclones of RN were obtained, while all subclones of HP were pigmented. Relatively constant levels of dopa-oxidase activity were maintained throughout the growth cycle of RN. The dopa oxidase activity of HP was 5- to 10-fold less than that of RN. Both RN and HP were treated in suspension with β -propiolactone-inactivated Sendai virus. Over 52% of the HP nuclei and over 43% of the RN nuclei were found in homokaryons, indicating that both HP and RN are promising candidates for use in hybridization experiments.

6977 CLOACOGENIC (BASALOID) CARCINOMA SHOWING ELASTIC TISSUE PROLIFERATION: REPORT OF TWO CASES. (E.) Subbuswamy, S. G. (Grant Med. Coll., Bombay, India), A. G. Bhavthankar and R. K. Gadgil. *Indian J Cancer* 10(3):366-369, 1973.

Two cases of cloacogenic carcinoma, one occurring in a 62-yr-old Hindu male and the other occurring in a 54-yr-old Hindu male, are reported. Histologically, the two tumors were nearly identical, both being composed of clumps of round to polyhedral cells with indistinct cellular outline, scanty cytoplasm and large hyperchromatic nuclei with numerous mitotic figures. Both tumors contained a large number of elastic fibers in the stroma. The excess elastic fibers appeared to be a result of elastic tissue proliferation. These tumors were morphologically similar to basal cell carcinomas of the skin. It is possible that the morphological similarity is accompanied by the production of a humoral substance capable of inducing new elastic tissue formation.

6978 STAGE I-A CERVICAL CANCER. (Fr.) Raymond, P. E. (Hotel Dieu, Quebec, Canada) and H. L. Kottmeier. *Union Med Can* 102(12):2518-2522, 1973.

6979 CANINE TRANSMISSIBLE VENERAL SARCOMA: TRANSPLANTATION STUDIES IN NEONATAL AND ADULT DOGS. (E.) Yang, T. J. (U. Tennessee Mem. Res. Ctr., Knoxville) and J. B. Jones. *J Natl Cancer Inst* 51(6):1915-1918, 1973.

6980 TOXIC METABOLITES RELEASED FROM RAT HEPATOMA CELLS IN CULTURE. I. EFFECTS OF METABOLITES OF HEPATOMAS ON VARIOUS CELLS. (E.) Katsuta, H. (Inst. Med. Sci., Tokyo, Japan), T. Takaoka and S. Yasumoto. *J Natl Cancer Inst* 51(6):1841-1848, 1973.

6981 FREQUENCY OF ORAL PRECANCEROUS CONDITIONS IN 407 MALAYSIANS - WITH CORRELATION TO ORAL HABITS. (E.) Ramanathan, K. (Inst. Med. Res., Kuala Lumpur, Malaysia), A. Canaganayagam, T. C. Keat and A. Retnanesan. *Med J Malaysia* 27(3):173-181, 1973.

6982 GESTATIONAL CHORIOCARCINOMA. (E.) Li, M. C. (Nassau Hosp., Mineola, N.Y.). *Cancer Bull* 25(4):70-71, 1973.

6983 PRIMARY TUMORS OF THE THORACIC WALL. (Fr.) Morand, G. (U. Hosp. Ctr., Strasbourg, France), M. Katzner, G. Miech, C. Irrmann and J. P. Witz. *Poumon Coeur* 28(9/10):503-510, 1972.

6984 METASTASIZING APPENDICEAL CARCINOIDS WITH CARCINOID SYNDROME. (Ger.) Marincek, B. (Inst. Pathol. Anat., U. Zurich, Switzerland). *Schweiz Med Wochenschr* 103(46):1641-1646, 1973.

6985 THIRTY-SEVEN APPARENTLY PRIMARY TUMORS OF THE RIBS. (Fr.) Levasseur, P. (Marie Lannelongue Ctr. Thoracic Cardiovascular Surg., Paris, France), A. Rojas-Miranda and M. Merlier. *Poumon Coeur* 28(9/10):495-502, 1972.

6986 GLYCOGEN SYNTHETASE OF RAT SKELETAL MUSCLE AND HEPATOMAS AND ITS COMPARISON WITH THE ENZYME OF RAT LIVER. (E.) Sato, K. (Res. Inst. Tuberculosis, Leprosy, Cancer, Sendai, Japan), N. Abe and S. Tsuiki. *Biochim Biophys Acta* 268(3):646-653, 1972.

6987 PROGNOSTIC TYPING IN BREAST CANCER. FURTHER INVESTIGATION OF A NECROPSY SERIES COMPARED WITH RECENT SURGICAL SPECIMENS. (E.) Maehle, B. O. (Gade Inst., Bergen, Norway) and F. Hartveit. *J Clin Pathol* 26(10):784-791, 1973.

6988 BIOCHEMICAL CHARACTERIZATION OF GLYCOLIPIDS FROM SARCOMA 180 CELLS. (E.) Takeda, S. (Res. Inst. Tuberculosis, Leprosy and Cancer, Tohoku Univ., Sendai, Japan). *Sci Rep Res Inst Tohoku Univ* 19(2):64-67, 1972.

- 6989 SERIAL *IN VITRO* MARROW CULTURE IN ACUTE MYELOCYTIC LEUKEMIA. (E.) Bull, J. M. (Nat'l. Cancer Inst., Bethesda, Md.), M. J. Duttera, E. D. Stashick, J. Northup, E. Henderson and P. P. Carbone. *Blood* 42(5):679-686, 1973.
- 6990 COLORECTAL POLYPS. (E.) Turell, R. (No affiliation). *S Afr Cancer Bull* 17(3):85-88, 1973.
- 6991 CHANGING PATTERNS OF BREAST CANCER. (E.) Cady, B. (Lahey Clinic Dept. Surg., Boston, Mass.). *Lahey Clin Found* 22(4):125-131, 1973.
- 6992 OCCULT INVASIVE CARCINOMA OF THE UTERINE CERVIX. (Cz.) Bouda, J. (Med. Fac., Charles U., Plzen, Czechoslovakia) and J. Mleziva. *Cesk Gynekol* 38(6):408-410, 1973.
- 6993 LACTATE DEHYDROGENASE ACTIVITY IN PATIENTS WITH CARCINOMA OF THE ENDOMETRIUM. (Cz.) Jandova, A. (Fac. Gen. Med., Charles U., Prague, Czechoslovakia), L. Laurova, A. Pezlarova and V. Skoda. *Cesk Gynekol* 38(6):417-419, 1973.
- 6994 BENIGN OSTEOSTOMA. RARE LOCALIZATION IN THE MAXILLA? (Ger.) Wickenhauser, J. (Inst. Radiol. Diagnosis, U. Vienna, Austria), H. Strassl and K. Hollmann. *Fortschr Geb Roentgenstr* 119(5):618-623, 1973.
- 6995 REGULATION OF CYCLIC AMP-METABOLIZING ENZYMES BY CALCIUM IONS IN RAT EMBRYONIC FIBROBLASTS. (Ger.) Grimm, J. (Max Planck Inst. Virus Res., Tübingen, Germany) and W. Frank. *Eur J Biochem* 40(2):555-563, 1973.
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